#288

EXPLORER 42

X-RAY ALL SKY SURVEY

DAILY SUMMARY DATA

70-107A-01A, 01B, 01C, 01G

SAS-A

SOURCE LIBRARY TAPE

70-107A-01B

This data set has been restored. There was originally one 9-track, 800 BPI tape written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tape was created on a 7094 computer and the restored tape was created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D number are as follows:

DR#	DS#	D#	FILES
DR004837	DS004837	D010072	1

o D010072: Read errors occurred in records 77, 276 of file 1.

See 70-107A-01C

REQ. AGENT	RAND NO.	ACQ. AGENT

EXPLORER 42

X-RAY ALL SKY SURVEY

DAILY SUMMARY DATA

70-107A-01C

This data set has been restored. There were originally 92 9-track, 800 BPI, Binary, multi-filed and standard labels. There are 15 restored tapes. The DR tapes are 3480 cartridges and the DS tapes are 6250 BPI. The DR and DS numbers along with the time spans are given as follows:

DR #	DS #	DD #	FILES	TIME SPAN
DR03042	DS03042	D-10073	1 - 29	12/19/70 - 12/20/70
		D-10074	30 - 52	12/21/70 - 12/21/70
		D-10075	53 - 75	12/21/70 - 12/22/70
		D-10076	76 - 98	12/23/70 - 12/24/70
		D-10077	99 - 121	12/23/70 - 12/24/70
		D-10078	122 - 144	12/26/70 - 12/27/70
		D-10079	145 - 167	12/28/70 - 12/28/70
		D-10080	168 - 180	12/28/70 - 12/28/70
DR03043	DS03043	D-10081	1 - 23	12/29/70 - 12/29/70
		D-10082	24 - 46	12/30/70 - 12/30/70
		D-10083	47 - 69	12/30/70 - 12/31/70
		D-10084	70 - 92	12/31/70 - 12/31/70
		D-10085	93 - 115	01/01/70 - 01/02/71
		D-10086	116 - 138	01/02/71 - 01/02/71
		D-10087	139 - 161	01/03/71 - 01/03/71
		D-10088	162 - 184	01/03/71 - 01/04/71
DR03044	DS03044	D-10089	1 - 23	01/04/71 - 01/05/71
		D-10090	24 - 46	01/05/71 - 01/06/71
		D-10091	47 - 69	01/06/71 - 01/07/71
		D-10092	70 - 92	01/08/71 - 01/08/71
		D-10093	93 - 115	01/09/71 - 01/10/71
		D-10094	116 - 138	01/09/71 - 01/10/71
		D-10095	139 - 161	01/11/71 - 01/11/71
DR03045	DS03045	D-10096	1 - 25	01/11/71 - 01/11/71
		D-10098	26 - 48	01/13/71 - 01/14/71
		D-10099	49 - 71	01/14/71 - 01/15/71
		D-10100	72 - 94	01/21/71 - 01/21/71
		D-10102	95 - 127	01/15/71 - 01/16/71
		D-10103	128 - 140	01/17/81 - 01/18/71

DR03046	DS03046	D-10104	1 - 23	01/18/71 - 01/18/71
		D-10105	24 - 46	01/19/71 - 01/20/71
		D-10106	47 - 69	01/22/71 - 01/22/71
DR03047	DS03047	D-12939	1 - 23	12/16/70 - 12/17/70
		D-12942	24 - 52	12/17/70 - 12/18/70
		D-12934	53 - 75	12/21/70 - 12/21/70
		D-12905	76 - 98	12/21/70 - 12/22/70
		D-12933	99 - 121	12/21/70 - 12/22/70
		D-12936	122 - 145	12/22/70 - 12/23/70
DR03048	DS03048	D-12935	1 - 23	12/24/70 - 12/25/70
		D-12938	24 - 46	12/26/70 - 12/26/70
		D-12937	47 - 69	12/28/70 - 12/28/70
		D-12913	70 - 94	12/31/70 - 01/01/71
		D-12911	95 - 115	01/02/71 - 01/03/71
		D-12941	116 - 138	01/03/71 - 01/03/71
DR03049	DS03049	D-12912	1 - 23	01/03/71 - 01/04/71
		D-12907	24 - 46	01/04/71 - 01/05/71
		D-12908	47 - 69	01/07/71 - 01/08/71
		D-12931	70 - 92	01/08/71 - 01/09/71
		D-12904	93 - 117	01/11/71 - 01/12/71
		D-12916	118 - 140	01/13/71 - 01/14/71
DR03050	DS03050	D-12914	1 - 23	01/15/71 - 01/16/71
		D-12919	24 - 46	01/17/71 - 01/18/71
		D-12920	47 - 69	01/18/71 - 01/18/71
		D-12918	70 - 92	01/18/71 - 01/18/71
		D-13671	93 - 115	01/19/71 - 01/20/71
		D-12932	116 - 138	01/21/71 - 01/21/71
DR03051	DS03051	D-12910	1 - 21	01/22/71 - 01/22/71
		D-12909	22 - 44	01/22/71 - 01/23/71
		D-12906	45 - 67	01/23/71 - 01/24/71
		D-12915	68 - 90	01/24/71 - 01/25/71
		D-12903	91 - 114	01/27/71 - 01/28/71
DR03052	DS03052	D-12940	1 - 24	01/24/71 - 01/25/71
		D-12930	25 - 48	01/26/71 - 01/27/71
		D-12917	49 - 71	01/27/71 - 01/28/71
		D-12927	72 - 95	01/28/71 - 01/29/71
		D-12928	96 - 119	01/29/71 - 01/30/71
		D-12925	120 - 143	01/30/71 - 01/31/71
DR03053	DS03053	D-12926	1 - 24	02/01/71 - 02/02/71
		D-12923	25 - 48	02/02/71 - 02/03/71
		D-12924	49 - 72	02/03/71 - 02/04/71
		D-12929	73 - 96	02/04/71 - 02/05/71
		D-12943	97 - 120	02/04/71 - 02/05/71
		D-13670	121 - 144	02/06/71 - 02/07/71
DR03054	DS03054	D-13668	1 - 23	02/09/71 - 02/10/71
		D-13669	23 - 46	02/10/71 - 02/11/71
		D-13667	47 - 69	02/11/71 - 02/12/71
		D-13666	70 - 92	02/12/71 - 02/13/71
		D-12665	93 - 115	02/13/71 - 02/14/71
		D-12664	116 - 138	02/14/71 - 02/15/71

DR03055	DS03055	D-13663	1 - 23	02/15/71 - 02/16/71
		D-13662	24 - 46	02/16/71 - 02/17/71
		D-13679	47 - 70	02/25/71 - 02/26/71
		D-13681	71 - 94	03/02/71 - 03/03/71
		D-13680	95 - 117	03/07/71 - 03/08/71
		D-13677	118 - 140	04/18/71 - 04/19/71
DR03056	DS03056	D-13678	1 - 23	04/19/71 - 04/20/71
		D-13676	24 - 46	04/20/71 - 04/21/71
		D-13682	47 - 69	04/21/71 - 04/22/71
		D-13674	70 - 93	04/21/71 - 04/22/71
		D-13675	94 - 116	05/15/71 - 05/15/71
		D-13673	117 - 140	05/15/71 - 05/16/71
		D-13672	141 - 163	05/16/71 - 05/17/71

EXPLORER 42

X-RAY ALL SKY SURVEY

DAILY SUMMARY DATA

70-107A-01A, B, C

Data Set -01A consists of one executable systems program tape. Data Set -01B consists of one source library tape. These tapes are 800 BPI, ASCII E~~BCDI~~C, 9-track, and were created on an IBM 360 computer. Data Set -01C consists of 90 Daily Summary Data tapes. Thirty of these tapes are 800 BPI and 60 of them are 1600 BPI. All of the tapes are 9-track, binary, multi-filed, created on an IBM 360 computer. These tapes contain standard labels without Y or Z numbers.

70-107A-01A — released

D#	C#	FILES	STANDARD LABEL (VOL=SER)	TIME SPAN
D-10071	C-11321	1	Z0350	
70-107A-01B				
D-10072	C-11322	1	Z1280	
70-107A-01C (800 BPI)				
D-10073	C-11323	29	Z0350	12/19/70 - 12/20/70
D-10074	C-11324	23	Z0997	12/21/70 - 12/21/70
D-10075	C-11325	23	Z1409	12/21/70 - 12/22/70
D-10076	C-11326	23	Z2136	12/23/70 - 12/23/70
D-10077	C-11327	23	Z2137	12/23/70 - 12/24/70
D-10078	C-11328	23	Z1289	12/26/70 - 12/27/70
D-10079	C-11329	23	Z0350	12/28/70 - 12/28/70
D-10080	C-11330	23	Z0997	12/28/70 - 12/28/70
D-10081	C-11331	23	Z1289	12/29/70 - 12/29/70

D#	C#	FILES	STANDARD LABEL (VOL=SER)	TIME SPAN
D-10082	C-11332	23	Z2137	12/30/70 - 12/30/70
D-10083	C-11333	23	Z1409	12/30/70 - 12/31/70
84	C-11334			
D-10085	C-11335	23	Z1280	1/01/70 - 1/02/71
86	C-11336			
D-10087	C-11337	23	Z0999	1/03/71 - 1/03/71
88	C-11338			
D-10089	C-11339	23	Z1289	1/04/71 - 1/05/71
D-10090	C-11340	23	Z2136	1/05/71 - 1/06/71
D-10091	C-11341	23	Z1280	1/06/71 - 1/07/71
D-10092	C-11342	23	Z0350	1/08/71 - 1/08/71
D-10093	C-11343	23	Z0997	1/08/71 - 1/09/71
D-10094	C-11344	23	Z1289	1/09/71 - 1/10/71
D-10095	C-11345	23	Z2136	1/11/71 - 1/11/71
D-10096	C-11346	25		1/11/71
D-10098	C-11347	23	Z2137	1/13/71 - 1/14/71
D-10099	C-11348	23	Z1409	1/14/71 - 1/15/71
D-10100	C-11349	23	Z2136	1/21/71 - 1/21/71
D-10101		23		1/21/71 - 1/22/71
D-10102	C-11351	23	Z2137	1/15/71 - 1/16/71
D-10103	C-11352	23	Z2136	1/17/71 - 1/18/71
D-10104	C-11353	23	Z1409	1/18/71 - 1/18/71
D-10105	C-11354	23	Z0350	1/19/71 - 1/20/71
D-10106	C-11355	23	Z1280	1/22/71 - 1/22/71

70-107A-01C (1600 BPI)

D#	C#	FILES	STANDARD LABEL (VOL=SER)	TIME SPAN
D-12903	C-12743	24	Z2137	1/27/71 - 1/28/71
D-12904	C-12744	25	Z1289	1/11/71 - 1/12/71
D-12905	C-12745	23	Z1041	12/21/70 - 12/22/70
D-12906	C-12746	23	Z2136	1/23/71 - 1/24/71 (23)
D-12907	C-12747	23	Z0994	1/04/71 - 1/05/71
D-12908	C-12748	23	Z1041	1/07/71 - 1/08/71
D-12909	C-12749	23	Z1408	1/22/71 (12) - 1/23/71 (13)
D-12910	C-12750	21	Z1409	1/22/71 - 1/22/71
D-12911	C-12751	23	Z2137	1/02/71 - 1/03/71

D#	C#	FILES	STANDARD LABEL (VOL=SER)	TIME SPAN
D-12912	C-12752	23	Z1289	1/03/71 - 1/04/71
D-12913	C-12753	23	Z2136	12/31/70 - 1/01/71
D-12914	C-12754	23	Z0996	1/15/71 - 1/16/71
D-12915	C-12755	23	Z1289	1/24/71 - 1/25/71
D-12916	C-12756	23	Z0350	1/13/71 - 1/14/71
D-12917	C-12757	23	Z1408	1/27/71 - 1/28/71
D-12918	C-12758	23	Z1282	1/18/71 - 1/18/71
D-12919	C-12759	23	Z1409	1/17/71 - 1/18/71
D-12920	C-12760	23	Z1409	1/18/71 - 1/18/71
D-12923	C-12761	24	Z1280	2/02/71 - 2/03/71
D-12924	C-12762	24	Z0996	2/03/71 - 2/04/71
D-12925	C-12763	24	Z1409	1/30/71 - 1/31/71
D-12926	C-12764	24	Z1280	2/01/71 - 2/02/71
D-12927	C-12765	24	Z1252	1/28/71 - 1/29/71
D-12928	C-12766	24	Z2137	1/29/71 - 1/30/71
D-12929	C-12767	24	Z0996	2/04/71 - 2/05/71
D-12930	C-12768	24	Z2137	1/26/71 - 1/27/71
D-12931	C-12769	23	Z0994	1/08/71 - 1/09/71
D-12932	C-12770	23	Z0350	1/21/71 - 1/21/71
D-12933	C-12771	23	Z2136	12/21/70 - 12/22/70
D-12934	C-12772	23	Z0348	12/21/70 - 12/21/70
D-12935	C-12773	23	Z1041	12/24/70 - 12/25/70
D-12936	C-12774	24	Z0343	12/22/70 - 12/23/70
D-12937	C-12775	23	Z0998	12/28/70 - 12/28/70
D-12938	C-12776	23	Z2137	12/26/70 - 12/26/70
D-12939	C-12777	23	Z1252	12/16/70 - 12/17/70
D-12940	C-12778	24	Z0350	1/24/71 - 1/25/71
D-12941	C-12779	23	Z1409	1/03/71 - 1/03/71
D-12942	C-12780	29	Z1252	12/17/70 - 12/18/70

D#	C#	FILES	STANDARD LABEL (VOL=SER)	TIME SPAN
D-12943.	C-12781	24	Z1280	2/04/71 - 2/05/71
D-13662	C-12782	24	Z1289	2/16/71 - 2/17/71
D-13663	C-12783	23	Z2137	2/15/71 - 2/16/71
D-12664	C-12784	23	Y1523	2/14/71 - 2/15/71
D-12665	C-12785	23	Y1522	2/13/71 - 2/14/71
D-13666	C-12786	23	Z0342	2/12/71 - 2/13/71
D-13667	C-12787	23	Z0994	2/11/71 - 2/12/71
D-13668	C-12788	23	Z0996	2/09/71 - 2/10/71
D-13669	C-12789	23	Z0997	2/10/71 - 2/11/71
D-13670	C-12790	24	Z0998	2/06/71 - 2/07/71
D-13671	C-12791	23	Z2137	1/19/71 - 1/20/71
D-13672	C-12792	24	Y1523	5/16/71 - 5/17/71
D-13673	C-12793	24	Z0350	5/15/71 - 5/16/71
D-13674	C-12794	24	Z2135	4/21/71 - 4/22/71
D-13675	C-12795	23	Z2136	5/15/71 - 5/15/71
D-13676	C-12796	23	Y1521	4/20/71 - 4/21/71
D-13677	C-12797	23	Z1409	4/18/71 - 4/19/71
D-13678	C-12798	23	Z1284	4/19/71 - 4/20/71
D-13679	C-12799	24	Z2135	2/25/71 - 2/26/71
D-13680	C-12800	23	Y1515	3/08/71 - 3/09/71
D-13681	C-12801	24	Z0340	3/02/71 - 3/03/71
D-13682	C-12802	23	Z0348	4/22/71 - 4/23/71

Data Set Name: SAS.P100.ORBITNx.+R

The data set iss fixed blocke, 45 bytes/logical record and 10 logical records/physical record.

(RECFM=FB,LRECL=45,BLKSIZE=450)

LOGICAL RECORD FORMAT

ITEM	LENGTH (IN BYTES)	POSITION IN RECORD (BYTES)	TYPE
1. Actual Orbit ID	5	1- 5	EBCDIC Characters
2. Start time for orbit in days and fraction of days since Jan. 0, 1970. (see Documentation)	8	6-13	Double precision binary
3. Stop time for orbit (see documentation)	8	14-21	Double precision binary
4. Stations number		22-25	Binary integer
Minor frame LO	4	26-29	Binary integer
Minor frame HI	4	30-33	Binary integer
Minor frame MAX	4	34-37	Binary integer
Sub frame LO	2	38-39	Binary integer
Sub frame HI	2	40-41	Binary integer
Sub frame MAX	2	42-43	Binary integer
Orbit station word	2	44-45	Binary integer

April 1, 1975

To: Memo for the record

From: Data Set Processing Group

Subject: Release of DD10071 (70-107A-01A).

Please release DD10071 and the corresponding dupe DC11321. This data set, is being released at the request of the responsible Acquisition Scientist. The tape contains a dump of the object modules on disk and is not useable by anyone except the experimenter. Data set 70-107A-01B contains the source decks for these object modules and would be more useful to the user than data set 01A.

70-107A-01
SAS-A
Explorer 42
UH URU

AMERICAN SCIENCE AND ENGINEERING

22 MAY 1972

ASE-2960

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THE UHURU DATA REDUCTION AND ANALYSIS SYSTEM

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ASE-2960

THE UHURU DATA REDUCTION AND ANALYSIS SYSTEM

Prepared Under Contract NAS5-11422 for:

National Aeronautics and Space Administration
Goddard Space Flight Center
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By:

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22 May 1972

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I.0 INTRODUCTION

This document describes the automatic computer processing system which was developed and is now in use at AS&E for reducing and analyzing data from the UHURU X-ray astronomy satellite.

The satellite scans the sky by spinning slowly (12 min. period) with collimated detectors looking out approximately perpendicular to the spin axis. The spin axis is held fixed in the sky for about a day at a time, during which a $\simeq 10^{\circ}$ band about the equator of the spin axis is scanned (see fig. 1). Star and sun sensors provide aspect data so that we can determine later where the detectors were pointing versus time.

Our primary data reduction objective is to superimpose the X-ray data from the 120 or so sweeps through a day's 10° band. The superposition is equivalent to a single sweep through the band with total observing time of one day. This increases our sensitivity in that band greatly over what we could obtain from a single twelve minute sweep. Essential to performing this superposition is solving the aspect of the satellite and obtaining an analytic rotational equation of motion which allows the data from many different sweeps to be precisely registered with respect to each other. Other objectives of the system are to detect and locate X-ray sources in the data, and to obtain X-ray spectra of these sources.

An overall flowchart of the UHURU processing system is shown in Figure 2. The input data for the processing are contained in three sets: the telemetry tape, the ephemeris tape and the control card deck. The UHURU processing system is contained on another tape. The results of the processing are preserved on the SASA Output Tape. Further processing can be done by reading the contents of the Output Tape back onto a disk, accessing the desired data set, and processing it further, either with a portion of the standard SASA program library under different control parameters, or with a new program written to accomplish the specialized needs of the user. Such a new program cannot be written without detailed knowledge of the file structure of the data sets in the SASA Output Tape. The structure of these files is described in a series of documents under preparation at AS&E

The processing system embodied in the SASA system library is described in Section II; the general nature of the data sets contained in the SASA Output Tape is outlined in Section III, and a guide to the resulting hard copy data sets (printout and plots) is given in Section IV.

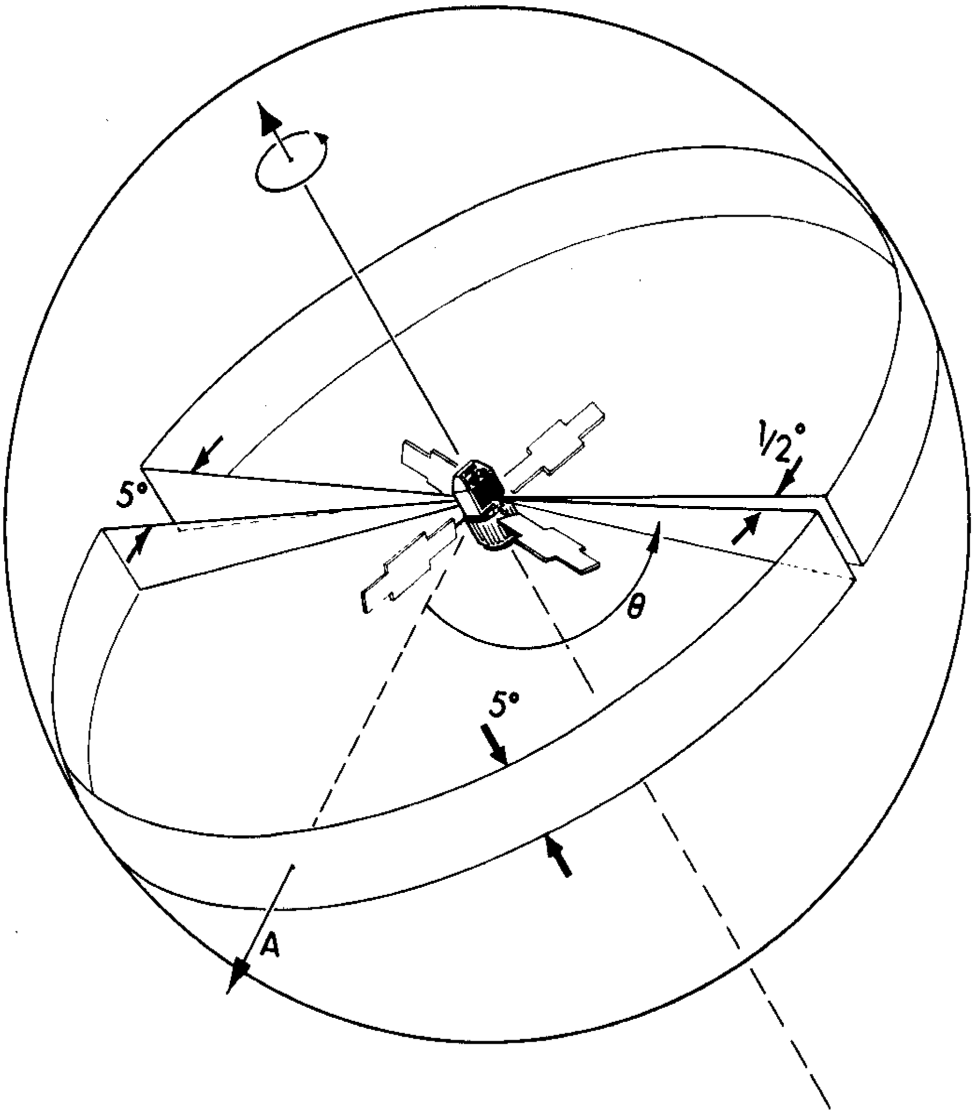
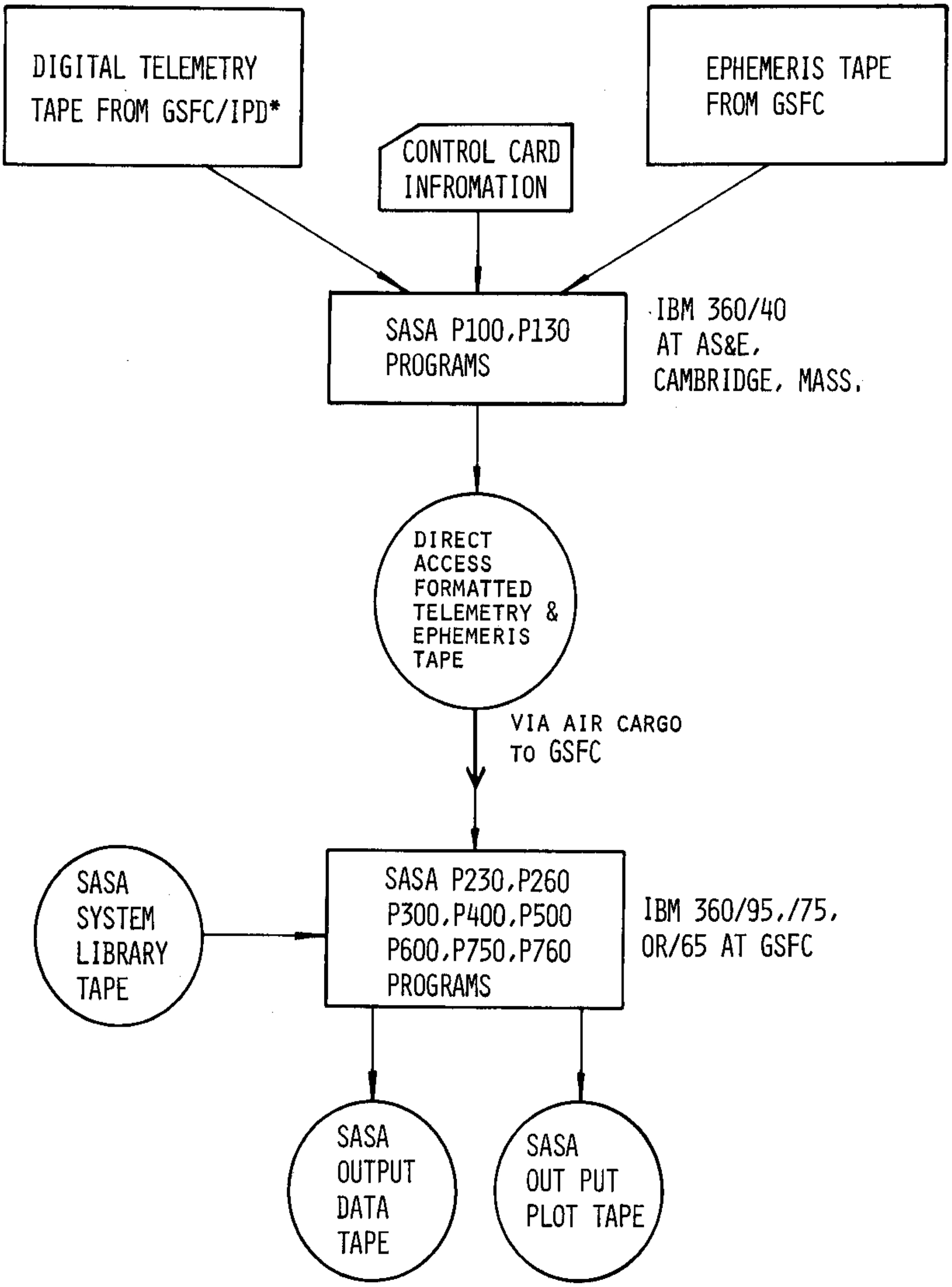


Figure 1 - Band of the sky swept out by the UHURU X-ray detectors during a satellite spin. The fields of view are indicated as the FWHM of each collimator. The angular position (θ) of a detector is the relative location in this band withrespect to a fixed direction in the sky (A). This coordinate is called the azimuth of the detector.



*GSFC/IPD: GODDARD SPACE FLIGHT CENTER / INFORMATION PROCESSING DIVISION

Figure 2. Uhuru (SAS-A) Data System Flow Chart

II. PROCESSING SYSTEM LIBRARY DESCRIPTION

Normal production processing proceeds sequentially through 15 procedures designated as follows:

		Typical Run Time For One Day's Data (min.) IBM 360/95	360/40
P100	Telemetry tape-to-disk		180 min.
P110	Orbit index definition list		1 min.
P130	Ephemeris tape-to-disk		15 min.
P230	Star Identification	25	1250 min.
P260	Rotational Equation of Motion	2	140 min.
P300	X-ray superposition	2	120 min.
P400	X-ray Peakfit	2	120 min.
P500	Crossing Window	1	60 min.
P600	3-Sigma Processor	2	20 min.
P750	Spectrum Analysis	1	60 min.
P760	Energy Calibration	1	
P910*	Decimal X-ray Dump		
P920*	Plot raw star & X-ray data		
P930*	Hex dump of T/M disk		
P960	System data set utility (unload)	1	
	Total:	37	1966

*Optional, not normally used

P100 - Telemetry Tape-To-Disk

This procedure reads the telemetry tape provided by GSFC (Goddard Space Flight Center) corresponding to one scan of the sky, with the spin axis nominally fixed. The data corresponding to one scan are called a data group, and can be up to two days' duration, but it normally covers about 24 hours or 15 orbits. The procedure screens out bad data, creates dummy fill-in data and blocks the data in proper order on a disk. It also checks the signal switching state of the instrument to assure valid data, by examining the telltales.

P110 - Orbit Index Definition List

For the data group being processed, this procedure lists the correspondence between universal time in days and decimal numbers. This is needed to execute some of the other programs properly because the data set may be defined by one of these variables, while the user knows another variable.

P130 - Ephemeris Tape-To-Disk

An orbital ephemeris tape for the satellite is supplied by GSFC. This procedure reads that tape and extracts the required ephemeris data for the time interval included in the data group being processed. These data are required for determining whether the detectors are looking at the earth or sky, and whether night or daytime sky is being viewed; also for eliminating data taken in the South Atlantic anomaly.

P230 - Star Identification (refer to Figure 3)

This procedure comprises the bulk of the processing system. Aspect data are identified and star (sun) pulses are recognized in the star (sun) sensor data. Using our knowledge of the star sensor reticle pattern, and estimates of the location of the satellite spin axis and spin rate, the procedure compares the observed pattern of star pulses with the expected pattern it generates from a star catalog contained as a permanent data set in the system (1950 equinox). Fifth magnitude or brighter stars from the SAO catalog are used. Elaborate iterative procedures are used to reject false star identifications and accept additional good ones. The result is a solution accurate to order $0^{\circ}.1$ for the spin axis, determined about every ten minutes of satellite real-time, as well as a 1% determination of the average spin rate. This "rough" solution with the sighting times of the accepted star pulses and star identifications is stored for input to P260.

P260 - Rotational Equation of Motion (refer to Figure 3)

In this procedure the X-ray data spin-to-spin superposition interval is defined. A refined analytic solution for the rotational motion of the satellite must be available for the entire interval. This can be up to 72 hours in duration, but the satellite spin axis must not have drifted more than 3° on the sky or the subsequent superposition will be broken up into several subintervals. Normally a data group is named "R00171", for example, which stands for revolution 00171 (orbit). This would be the orbit number of the beginning of the data group. If the spin axis drifts more than 3°, the system performs several superpositions named, for example, R00171, R00171A and so on. The spin axis drift is limited to 3° in each group.

A model of rotation including first-order spin rate change, second-order drift in spin axis location, and torque-free precession amplitude, frequency and phase is fit to the aspect sensor data. The torque-free precession is a perturbation on the rotation of the satellite, due to the effect of a rotor spinning in the same direction as the spin axis in the satellite. The solution typically is precise to about ±15 arc seconds in azimuth (angle about the spin axis, θ) and a few arc minutes in elevation (angle from the plane perpendicular to the spin axis, ϕ). It is described by a few constants of the equation of motion which are stored in a file for later use. Then, the superposition intervals are calculated according to the criteria specified above.

P300 - X-ray Superposition (refer to Figure 3)
An array is created, representing the average 360° circle scanned by the detector during a superposition interval, broken into 4320 (1080) elements of azimuth of 5' (20') each for the $1/2^{\circ}$ (5°) detector. Each X-ray data word is added to the array element corresponding to the location on the sky of the detector at the time the data word was collected as calculated from the equation of motion solution. In this way, the X-ray data are superimposed over many spins of the satellite. The result is an array of count rate versus azimuth

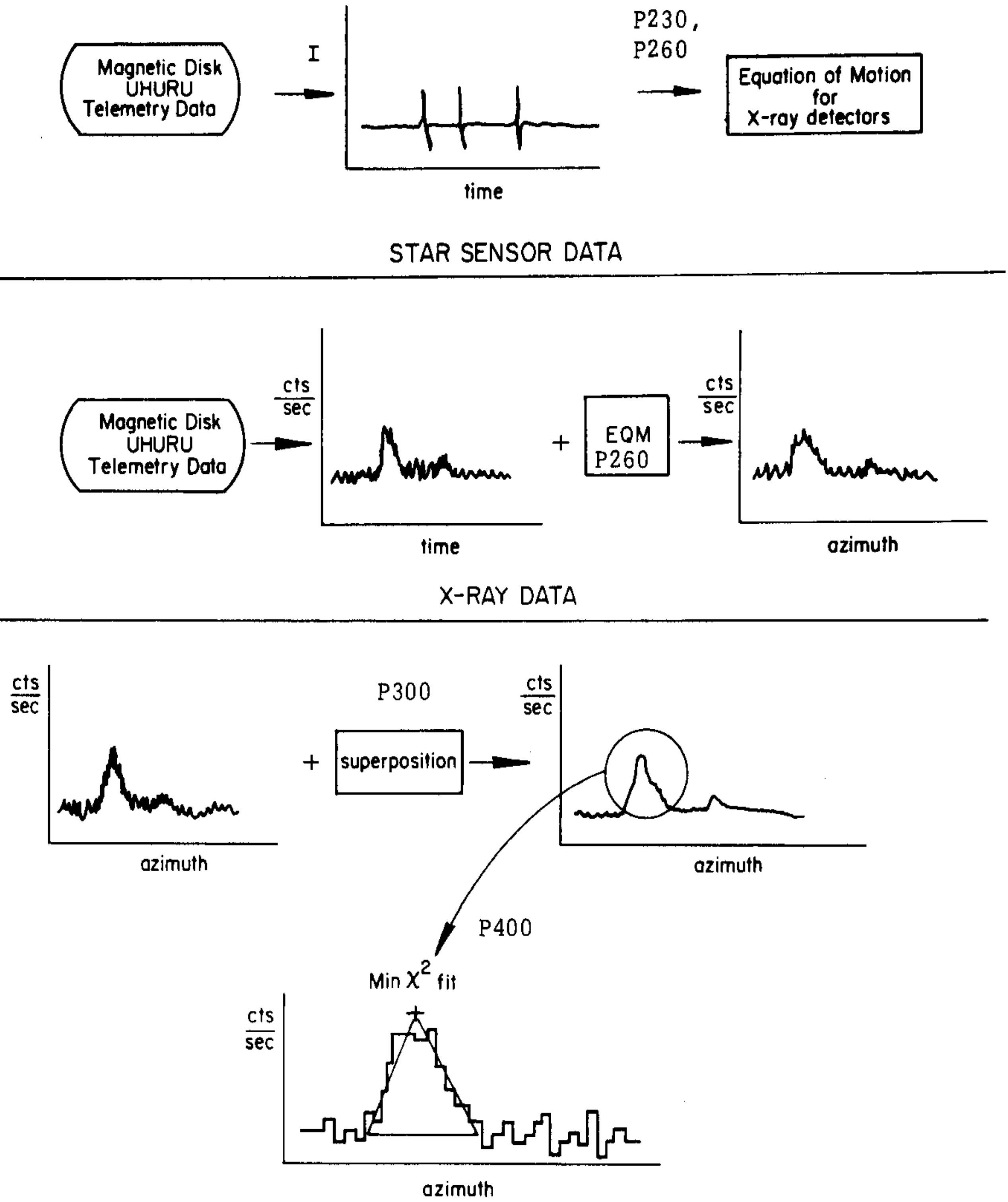


Figure 3 - The processing of data is schematically illustrated. Star sensor data is extracted from the telemetry data which was stored on magnetic disks and an equation of motion for the X-ray detectors is determined. Using this, the X-ray data which is on the telemetry disk as count rates vs. time can be transformed to count rate vs. azimuth. The data from a single spin axis orientation are summed (superimposed) increasing the signal to noise ratio and then these data are scanned for statistically significant peaks which are fit to the collimator response using a minimum x^2 technique.

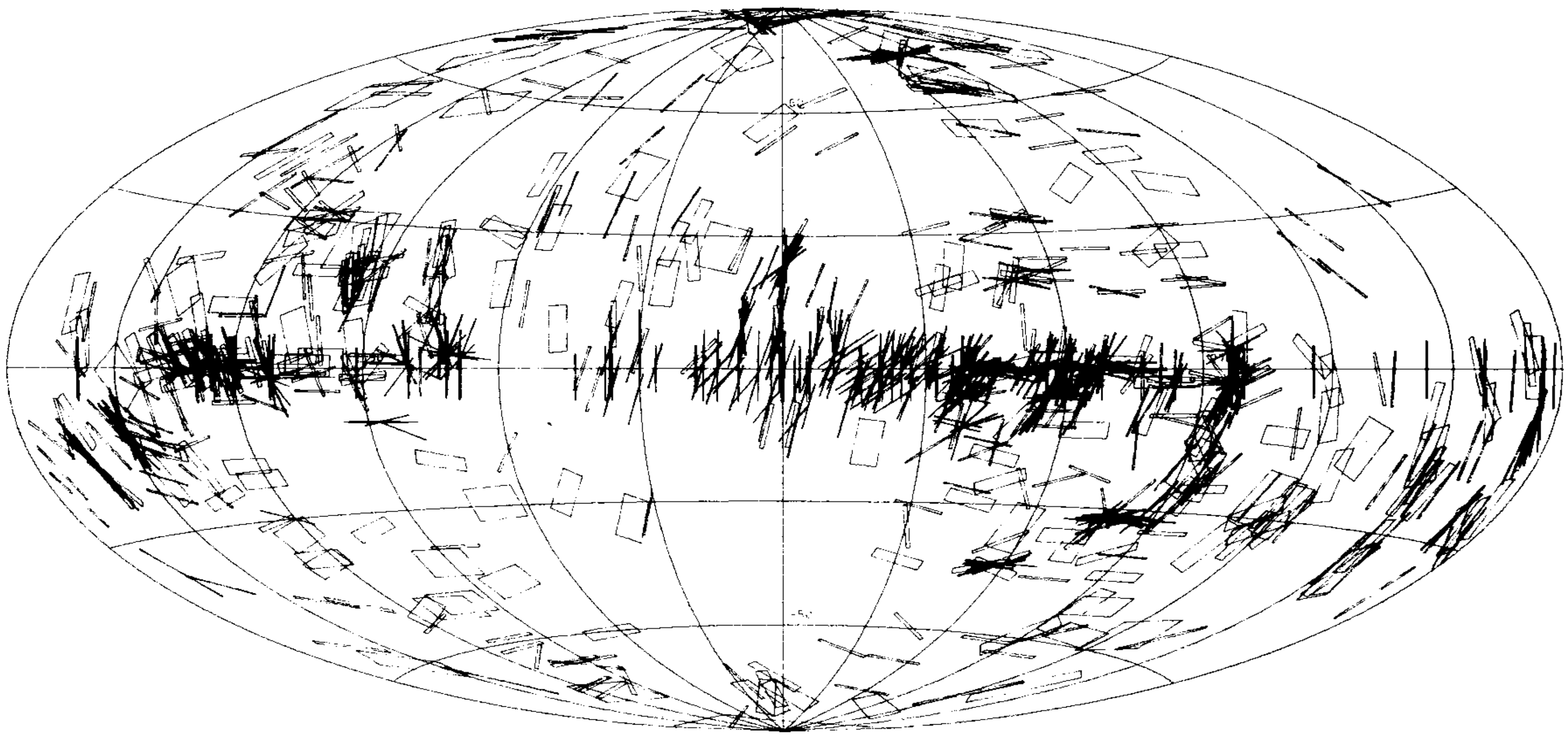


Figure 4 - Lines of position which result from the computer scan of superimposed data are plotted on an equal area projection of the sky in galactic coordinates. The line widths are $\pm 1\sigma$ as determined by the minimum χ^2 fits. There are 1171 lines on the plot.

with total exposure of order one day. As the data from each spin of the satellite are collected for superposition, the single spin data are scanned for possible peaks which are listed on an output file SPINPKS for future reference by the P600 3-Sigma program.

P400 - X-ray Peakfit

The objective of this procedure is to detect true X-ray sources and measure their location in azimuth and their intensity. Noise spikes are rejected, and confused regions of high source density are identified. Extended sources are detected, and an estimate of their width is made. An output file of lines of source position (azimuth) is generated. Figure 4 shows a plot of all the lines obtained from many different days' scans. Intersecting lines from several different days are used to obtain accurate source locations.

P500 - Crossing Window

This procedure inverts the equation of motion so that for a given azimuth all time intervals, or windows, when that azimuth was in the field of view of each detector are calculated, for all times when there is a valid equation of motion and no subcom gaps. These windows are used as inputs to P750.

P600 - 3-Sigma Processor

For each suspected peak from a single spin of the satellite, the T/M data are examined to see if there is a statistically significant peak and if so the data are fit to the collimator response to determine the location and strength of the X-ray source. This information is recorded in an output file SASA. P600. THREESIG. RXXXXX. If the source is one contained in a reference catalog of known strong sources stored in the system, it is so identified.

P750 - Spectrum Analysis

The 8-channel pulse height data for each source in the P400 lines file are extracted and printed out for each pass over the source. If more than 67 counts in channel 3 are observed from the source, a rough fit to power law, exponential and blackbody spectra is done. Then the PHA data are summed over the entire superposition interval and a rough fit is done. These results are printed only. The printout is stored in binders at AS&E in room 638. It is generally known as the "bulk output".

P760 - Energy Calibration

When the telltales indicate that the onboard Fe^{55} calibration sources are activated, the PHA system gain is measured and printed out. Experience has shown the gain to vary by about 4% for different days, mostly due to normal temperature excursions. Extreme temperatures are expected to cause greater gain shifts.

P910 - XRAYDUMP

The XRAYDUMP procedure is used to produce a time sequenced listing of part of the UHURU telemetry data (the X-ray data words only) formatted so as to be readily usable by the investigator. The program can produce such a listing from either raw telemetry tapes or from the SASA.P100.MINFRAME.RXXXXX file produced by the tape-to-disk program onto a 2314 disk pack. Program inputs are: a code to indicate whether telemetry is from disk or tape, start and stop times, and threshold levels for total counts per telemetry frame, below which output listing is suppressed.

P920 - Plot Raw Star and X-ray Data

A utility routine allowing graphic display of the raw data. Not normally used in production processing.

P930 - Hex Dump of Telemetry Disk

Generates a hexadecimal dump of the telemetry data (selected syllables). Useful for debugging. Also is the only access to commutated data. Not normally used in production processing.

P960-P970 - System Data Set Utility (Unload)

The P960 and P970 programs are used to automatically load and unload UHURU data batches between 2314 disk pack and magnetic tape.

The P960 program is used primarily at AS&E in Cambridge to:

1. Unload tape-to-disk (P100) data and Ephemeris data (P130) to tape to be sent to GSFC for further processing through the UHURU Production Processing System.

2. Load completed UHURU data batches from GSFC to 2314 disk at AS&E for summary investigation and more detailed final processing.

The P970 program is used exclusively at GSFC and is at the heart of the UHURU Automatic Processing System. The program is used to:

1. Load UHURU data batches onto available 2314 scratch volumes and catalog their location for further processing.

2. Load and ready the UHURU operating system on the /65, /75, or /95 computers at GSFC

3. Load an UHURU data batch as in '1' and load a temporary copy of a shortened version of the UHURU Automatic Processing System to scratch 2314 volumes.

4. Automatically unload finished UHURU data from 2314 scratch volumes to magnetic tape for shipment to AS&E.

5. Unload new copies of the UHURU Automatic Processing System to magnetic tape after update and SASA system library maintenance.

Both the P960 and P970 programs are used in conjunction with rather complicated catalog procedures for IBM 360. Information and description of these procedures are available from the UHURU group at AS&E in Cambridge.

III. OUTPUT TAPE DESCRIPTION

The SASA Output Tape is an image of a 2314-type disk containing a series of files listed below. The name of each file is in the following format:

SASA. PXXX. XXXXXXXX. RXXXXX
(a) (b) (c)

(a) Processing step which created the file

(b) Name of file

(c) Starting orbit number of telemetry data group

The files are:

SASA. P100. ORBITINX. RXXXXX
DEFINITION OF RANGE OF TELEMETRY PROCESSED
USED BY P110, P130, P230, P260, P300, P500, P600, P750, P760

SASA. P100. MINFRAME. RXXXXX
MINOR FRAMES OF TELEMETRY DATA
USED BY P110, P230, P300, P600, P750, P760

SASA. P100. SUBFRAME. RXXXXX
SUBCOMMUTATED TELEMETRY DATA
USED BY P110

SASA. P100. SUBGPSX1. RXXXXX
SUBCOM GAPS FOR SIDE 1
USED BY P300

SASA. P100. SUBGPSX2. RXXXXX
SUBCOM GAPS FOR SIDE 2
USED BY P300

SASA. P130. EPHEMERIS. RXXXXX
POSITION, VELOCITY EPHEMERIS DATA
USED BY P230,P300

SASA. P230. FINPOINT. RXXXXX
TRIPLET TABLE OF IDENTIFIED STARS (3 POINTS PER STAR)
USED BY P260

SASA. P230. RGHPOINT. RXXXXX
ROUGH SPIN AXIS POSITION FOR EACH TRIPLET TABLE OF IDENTIFIED STARS
USED BY P260

SASA. P260. EQMCNSTS. RXXXXX
CONSTANTS FOR THE ROTATIONAL EQUATION OF MOTION
USED BY P300, P500, P600

SASA. P260. SUPINTVS. RXXXXX
DEFINITION OF STABLE SUPERPOSITION PERIODS
USED BY P300

SASA. P300. CURNTSUP. RXXXXX
DEFINITION OF CURRENT SUPERPOSITION PERIOD BEING PROCESSED
USED BY P400, P500, P600, P750, P760

SASA. P300. XSPINPKS. RXXXXX
SINGLE PASS 3-SIGMA PEAKS ABOVE XRAY BACKGROUND
USED BY P500, P600

SASA. P300. XSUPDATA. RXXXXX
SUPERIMPOSED DATA FOR SIDE 1 AND SIDE 2
USED BY P400

SASA. P300. XIGPSCMB. RXXXXX
SIDE 1 SUPERPOSITION GAPS - COMBINATION OF ALL TYPES MERGED
USED BY P500

SASA. P300. X1GPSIND. RXXXXX
SIDE 1 SUPERPOSITION GAPS - EACH GAP FLAGGED (EARTH-BLOCK, SUBCOM ETC.)
USED BY P750, P760

SASA. P300. X2GPSCMB. RXXXXX
SIDE 2 SUPERPOSITION GAPS - COMBINATION OF ALL TYPES MERGED
USED BY P500

SASA. P300. X2GPSIND. RXXXXX
SIDE 2 SUPERPOSITION GAPS - EACH GAP FLAGGED (EARTH-BLOCK, SUBCOM ETC.)
USED BY P750, P760

SASA. P400. CURNTLIN. RXXXXX
LINES OF POSITION FROM SUPERIMPOSED XRAY DATA
USED BY P500, P600, P750

SASA. P400. XXSKYSUM. RXXXXX
EDITED SUPERIMPOSED DATA WITH NOISE REMOVED

SASA. P500. FLAREPKS. RXXXXX
SINGLE PASS XRAY FLARE EVENTS

SASA. P600. THREESIG. RXXXXX
FILE OF FITTED SINGLE PASS 3-SIGMA XRAY PEAKS

IV HARD COPY DATA SET DESCRIPTION

This section describes the printout and plots produced by the SASA data processing system. These hard copy data sets are stored at AS&E in the UHURU data room (638).

P100 Tape-To-Disk

The data are put on the disk by orbit groups. Usually these groups represent a day's worth of data. The tape-to-disk output lists each telemetry ground station receiving data within each orbit and shows where the data has had "parity" errors, undeterminable "parity" ("parity" check is done by comparing a frame of T/M data with a word within the next frame whose contents are a fixed function of the data content of the frame), frame sync errors, bit slip errors, and where there are data gaps. *

There is a listing of gaps at the end of the tape-to-disk (P100). These are times during which the data are not used in the superposition - long calibration, short calibration, radioactive calibration, PSD disabled, background anticoincidence disabled, PHA serial, and electronics cross switched. The existence of one of these conditions is determined by reading bits in the subcommutated data (telltales) indicating the logic and power switching state of the instrument. These gaps are called <u>subcom gaps</u>.

P110 - Orbit Index Definition List

The orbit index is a one page summary of the orbits in a data group. For each orbit the following information is given:
SEQ NO - sequence number of orbit within orbit group

*See document S2-0-43 "NASA SAS-A Satellite System Design and Interface Requirements", Johns Hopkins University Applied Physics Laboratory, April 1968.

ACTUAL IDENT. - five digit orbit name

STA. NO. - telemetry receiving station number where data was recorded, this is not always correct.

DURATION - length of orbit in seconds

START TIME - start time in universal time in days since Jan 0, 1970

STOP TIME - stop time in same units as START TIME

SUBCOM FRAMES - total number of subcom frames and the number of the first and last. Subcom frames contain subcommutative telemetry data.

MINOR FRAMES - total number of minor frames and the number of the first and last. The input to the rawplot program is the minor frame number.

DATA QUALITY - percent of good data to total; this is not accurate.

P130 - Ephemeris Tape-To-Disk

For each second of the data in a data group the following information is given:

DAY 1970	day of the year 1970 in universal time
DAY 1971	day of the year 1971 in universal time
SECONDS	seconds of the day in universal time
DAY SECONDS	day and fraction of a day in universal time since Jan 0, 1970
X, Y, Z	the direction cosines of the position of the satellite in celestial coordinates relative to the earth.
EARTH RADIUS	half angular size of the earth

P230 - Star Identification

The first page is a summary for an orbit of data telling when the satellite was in night and day, and for night, when each side was looking at earth and sky.

There follow the summary sheets for each set of star sightings identified. Each solution is identified by year and day of the data, orbit number (ACT. ORBIT=), solution number within orbit

(SET=) and date of processing. The parameters of the solution follow: spin axis position, spin rate, and phase. The phase is given by TZERO, the time at which the star sensor on side one passes zero azimuth, defined by a meridian passing through the spin axis direction and the vernal equinox. TOTAL SPIN AXIS DEV is the estimated error of the spin axis position in degrees of arc. Following the spin axis and phase information is a table of the identified stars giving for each one: SAO number, visual magnitude, position, sighting times in seconds (T1, T2, T3 correspond to transit times past the 3 slits of the star sensor reticle), which side of the satellite saw the star(SENSOR A=side 1=0.5° X-ray collimator), elevation in the field of view of the star sensor (positive elevation is towards spin axis direction), relative azimuth, and local spin rate (defined imprecisely by the separation of the first and third star pulses, T3-T1).

P260 - Rotational Equation of Motion

The program first produces a "rough fit" in which simple quadratic functions are fit to the spin rate and spin axis right ascension and declination. This preliminary fit is used to define superposition intervals and a "superposition coordinate system" (detailed below) and to reject individual star solutions which appear faulty. There is a page of output for each of the three least square solutions giving the parameters of the fit, e.g. $\omega = A_1 + A_2 t + A_3 t^2$ where ω is the spin rate and t is the time in seconds referenced from the center of the superposition interval.

The final form of the equation of motion solution involves two semi-empirical equations which are fit to the individual star sightings. These equations describe the position of the "center" of the side one star sensor (i.e. 90° from the spin axis, midway between the first and third slits of the sensor). The relevant offsets to relate this to the X-ray collimator centers can be obtained from AS&E personnel. The equations give azimuth (θ) and elevation (ϕ) in a right handed spherical coordinate system fixed in space whose pole ($\phi = +90^{\circ}$) is given by the average spin axis for the superposition interval and whose zero of azimuth is defined by the meridian passing through the pole and the vernal equinox. This coordinate system is defined separately for each superposition interval, and is the basis for the superposition of X-ray data from successive spins. A separate fit is done for each orbit, thus, as many sets of constants are given as there are orbits in the superposition interval. Each page is headed by the definition of the superposition interval: the start and stop times (U. T.) and the average spin axis which defines the coordinate system.

For each orbit the following information is given:

1) Orbit number. A plus sign indicates that the tape recorder playback occurred during the data interval. This is further described by a "GAP" in the status column, followed by a START and STOP time for the gap, and by two extra constants for each equation describing the interpolation over the gap.

2) STATUS - NITE - all data as of the time of writing is night-time data.

GOOD - the equation for θ or ϕ is to be believed.

***** - the equation for θ or ϕ could not be fit.

3) START & STOP time - the time interval during which the solution is valid

4) STARS - the number of stars identified. The numbers preceding THETA and PHI are the number of stars used in the respective fits.

5) PARAMETER & CONSTANTS: the variable in question, followed by the constants necessary to calculate it:

$\omega = \omega 1 + \omega 2*t + \omega 3*t^2$ rough fit spin rate

$\alpha = \alpha 1 + \alpha 2*t + \alpha 3*t^2$

$\delta = \delta 1 + \delta 2*t + \delta 3*t^2$ rough fit spin axis location

$$\theta = A1 + A2*t + A3*t^2$$
$$+A4*\sin(\theta_o*A10 + A5)$$
$$+A6*t*\sin(\theta_o*A10+A7)$$
$$+A8*t^2*\sin(\theta_o*A10+A9)$$
$$+H(t_j)*(A11+A12*t)$$
$$+ \text{corrections for drift and precession}$$

where

θ is the position of identified star in the average co-ord system

$H(tj) = 0$ for $t < tj$

$= 1$ for $t \geq tj$

tj = time of tape recorder playback

The equation for ϕ is similar to the equation for θ since the corrections for drift and precession involves information which the rough fit cannot provide, an iterative analysis is developed between the θ and ϕ equations to calculate the corrections which are of the order ± 2 arc mins. in general. For details consult A&SE personnel.

In all these equations, the time t is referenced to the center of the superposition interval:

$t = \text{U. T.} - t_m$

$t_m = (\text{U. T. START} + \text{U. T. STOP})/2.$

There are some small higher-order corrections to the above equations; for further details consult AS&E personnel.

The equation of motion produces six CALCOMP plots. The first three show the behavior of the spin rate and spin axis right ascension and declination as a function of U. T. The fourth is a "map" of spin axis right ascension vs. declination, with time tic marks. These first four plots correspond to the "rough fit" described above. The last two plots show the quality of the detailed equation of motion by comparing the positions of the observed stars with the fit equations for theta and phi as a function of U. T. The theta plot shows the difference (DELTA THETA) between the azimuth θ (as defined in 5 above) and a function A*t where A represents the average spin rate. The phi plot represents the actual elevation ϕ as defined above.

P300 - Superposition Program

The printout begins with a dump of the ORBIT-INDEX file which is qualified by the name "ORBDEF". This contains a description of the orbits to be included in the superposition, i. e. orbit numbers, start and stop times, number of frames of data. This is followed by a listing of the program control parameters, some of which are input via cards to control program execution. The control parameters are qualified by the name "CTLDTA". The next group of data printed out are the start and stop times of the equation of motion for each orbit of data included in the superposition. Included in this list are the start and stop times of the gaps in the superposition due to the South Atlantic Anomaly. The above printout is for diagnostic purposes and usually is of no importance to the user.

A new page of printout labeled "Table of Earthblocking for Superposition Period from   to   . " indicates the beginning of useful printout. This page is labeled "PAGE 1" in the upper right hand corner of the printout. It contains a list of times when the X-ray detectors are blocked by the earth and therefore these times are not included in the superposition.

Page 2 is a table of "SUBCOM GAPS". These are gaps introduced in the superposition due to the S. A. Anomaly, Earthblocking, manually input gaps and subcom gaps from P100. On page 3 a table of gaps is listed which is the result of combining all of the gaps on pages 1 and 2. It is the set of gaps which is actually used in determining what data are superimposed from the data group. The following output indicates the actual execution of the superposition phase of the program. Data from a single spin of the satellite are collected and tested for statistically significant peaks. As data are collected, the procedure which calculates the direction of the X-ray detectors (COORDS) is called and at each orbit boundary this procedure prints a message giving the relative orbit number and the start and stop time for the EQM. When a single spin of data (covering 360°) has been collected, the procedure which tests for peaks is invoked. This is indicated by the message "SINGLE PASS 3 SIGMA X-RAY PEAKS" followed by the average number of counts per bin in each side of the experiment and then a list of the peaks in the data. These peaks are also written onto a file SASA. P300. XSPINPKS. RXXXXX for use by programs P500 and P600. The processing of data and the subsequent printout continue in this way until the end of the superposition which is indicated by the message "SUPERPOSITION OVER AT XXXXX FRAMES".

A new page is started and the superimposed data are printed out with the bin numbers, number of counts, and number of minor frames
(BIN) (COUNTS) (T)
of exposure listed. The data for side 1 are listed (4320 bins) followed by the data for side 2 (1080 bins). These data are also written onto a file (SASA. P300. XSUPDATA. RXXXXX)

Several additional files are created during the execution of P300. These were discussed in Section III.

P400- X-ray Peakfit

A. <u>Printed Output:</u>

The contents of the superposition program file SUPDEFX are printed out giving the start and stop time of the superposition interval, the average spin axis coordinates and spin rate. This is followed by a title page "X1" which is a misnomer since the next page of output is the list of interesting objects possibly observable during the superposition interval. This list gives the object name, its coordinates in degrees of R. A. and Decl., and the elevation and azimuth in degrees for the current spin axis orientation. (Note in spacecraft coordinates the X-ray detectors X1 and X2 are at elevations of $1^{\circ}.118$ and $-1^{\circ}.228$ respectively.) The interesting objects list pertains to both side 1 and side 2. Immediately following this list is a list of the side 1 superposition data. The values given are bin numbers (12 bins per degree), the count rate (cts/sec) and exposure time (sec) for that bin.

The results of background estimates are listed on the next page. The background bin (3° width) number, the background rate (cts/sec) and its uncertainty are given. This is followed by the printed output describing the attempt to fit suspected peaks to the collimator response. First a sliding centroid test is made in which the integral count rate in a collimator width is calculated for various peak locations starting from low azimuth to high azimuth. If a significant positive excess in a collimator width is found, a centroid is calculated from the finite difference of adjacent half widths. Listed first are the counts and exposure times in a collimator half width and the difference in rates. The collimator location is incremented by one bin until a peak is detected and then finer divisions are used. For significant peaks the centroid fit is made and the results are printed out - azimuth of the centroid and uncertainty (the uncertainty is underestimated by about a factor of two) and an estimate of the peak amplitude and its uncertainty. The local background rate is also calculated and printed out, and the number of sigma in the peak are given. For peaks which appear extended a test is made by checking for an increase in the number of sigmas in a region of more than one collimator width. If there is an increase, then a fit to a uniform extended source is made which results in printout listing the assumed width in degrees, the χ^2 for the fit, and a centroid for the extended emission. If the peak contains enough σ's (2.4 side 1) then the data are fit to a triangle response, using a linearized iterative maximum likelihood technique. The results of this fit are given for each iteration and the best χ^2 value for azimuth and amplitude are summarized after a row of asterisks.

The above printout occurs for each suspected peak in the side 1 data. This is followed by the title page "X2" which is in turn followed by printout similar to that for side 1: the superposition data, potential peaks list, background summary, details of individual peak fits. (For side 2, a peak must contain more than the 2.0σ's to be fit to a triangle response.)

After the side 2 printout a summary of the peaks which have been successfully fit to the collimator response is given. This summary is repeated several times as tearoff sheets for various users. The summary gives the superposition interval, the spin axis coordinates and the azimuthal offset for this spin axis orientation (θ_o). For each fitted peak (source) the azimuth and uncertainty, the R. A. and Decl. of the line of position pivot point, the observed intensity and uncertainty are given. (Note the pivot point is the location in space through which a great circle through the spin axis passes which corresponds to the line of position of the source as determined by the peak. This line of position has length of 10° due to the collimator acceptance angle. (The pivot point is offset from the center of the line of position by $-1^{\circ}.352$ for side 1 and $-0^{\circ}.728$ for side 2)). Also listed are the elevation, local background rate and status flags for each peak. The elevation is the X1 or X2 collimator offsets if the source was detected only on one side, or an estimate of true source elevation if it was seen on both sides. The status flags indicate if an X1-X2 correlation has been made.

P400 - X-ray Peakfit

B. Plotted Output:

The side 1 ($0^{\circ}.5$ FWHM) X-ray superposition data are plotted in cts/sec vs. azimuth from 0° to 360°. For peaks which have been identified and fit by the P400 program a triangular response is also plotted. Special symbols are plotted as a function of azimuth to indicate the location of interesting objects within the collimator field of view (FOV). The displacement of these symbols from the azimuth axis indicates the elevation of the object. This X1 data plot is followed by a plot in which every four bins of X1 data are summed. No triangles or symbols are plotted. Following the summed X1 data plot detailed plots of the regions about each fitted peak are made. The fitted triangle is also plotted.

The side 2 ($5^{\circ}.0$ FWHM) X-ray superposition data are plotted similarly

P500 - Crossing Window

The first page lists the version of the procedure used and the gaps table. The version number indicates which solution for the equation of motion has been assumed (VERSION ONE old version, VERSION TWO new version). If this printout is not present, then it is the old version. Under GAP A is a list of gaps that is a combination of subcom gaps, and gaps introduced in the superposition for the one-half degree FWHM collimator and under GAP B for the five degree FWHM. This is the same list that appears on page 3 of P300.

The next page or pages is the SUMMARY OF CROSSING TIMES. The period of time covered is indicated by 'CROSSING TIMES START AT DAY' and CROSSING TIMES ENDS AT DAY' where the times are given in universal time since Jan 0, 1970. AVERAGE OMEGA is the spin rate of the satellite, AVERAGE ALPHA is the right ascension, and

AVERAGE DELTA is the declination.

For each peak (CURRENT LINE) the following information is given:

THETA	the azimuth of the peak
DELTA THETA	the uncertainty of the peak
X RAY SIDE	the side,where side one is 1/2 degree FWHM and side two is 5 degrees FWHM
ORBIT NO	each orbit within the period is listed separately followed by
T1, T2	the sighting times in milliseconds of the peaks that were used in the superposition

The next summary is the TABULATION OF FLARE EVENTS. This is an early version of the three sigma program. It processes significant single peak passes to see if they correspond to a source or if they are noise.

P600 - Trisigma Processor

The first page of output from this program is a list of the strong known sources, and for those which are observable during the superposition interval, the azimuth and elevation expected. On the following pages (1 per peak) the output consists of the record of this procedure's attempt to find significant excesses where the possibility of such peaks has been flagged by the SUPERPOSITION program P300. The version number specified in the first line indicates which solution for the equation of motion has been assumed (Old - Ver. 3, New - Ver. 4). The approximate azimuth of the suspected peak and the maximum time of occurrence are called "THETA" and "SPIN STOP TIME". The program iteratively determines the correct time corresponding to "THETA" and then sets time bounds which will bracket the expected peak by ±2 collimator widths. Status flags "STATUS OF PEAK TIME" indicate if a valid solution to the equation of motion exists at that time. "00" indicates valid results; "01" or "10" mean that there is no time corresponding to the azimuth θ which is included in the equation of motion. The experiment side (X1 or X2) is indicated by "SIDE=";00000000 means side X1, 10000000 means side X2.

Following the words "CHECK DATA FOR NOISE..." the number of data points,the estimated data point number of the peak,and the data point number limits corresponding to the collimator width are listed. The local background is then estimated excluding the data near the peak. (Values are in counts/bin.) The data are scanned for noise spikes which are eliminated and then the peak is found again by making a running average of five data points. The peak location and the collimator half width values are again listed after "RE-EVALUATE THE BACKGROUND..." and then the data are listed. Values of -1 indicate either noise which has to be supressed or data drop out. The local background is again estimated excluding the peak region and then a test is made for data points with rates more than 2σ above the local background. "TEST=" the number of counts which must be exceeded (i.e. 2σ above background) and "NUM" is the number of data points which exceed TEST. If NUM is less than 2, the data is considered not to contain a significant peak and the message "THIS PEAK IS NOT SIGNIFICANT" is printed. If NUM is greater or equal to 2, a centroid fit is attempted using the method of a running average (sliding centroid). For each possible peak in the data a test is made for significance with a message printed out either:

a. "SIGNIFICANT ZERO." followed by the centroid time as a day and fraction, relative data bin number of centroid, azimuth corresponding (not modulo 360) to the centroid time, the total number of counts and data bins included in the full width of the collimator and the number of sigmas above local background in this peak.

b. "DISTRIBUTION ABOUT", time bin, "IS NOT SIGNIFICANT" followed by the total counts and bins and the number of sigmas above local background. There must be more than 3.0σ to be considered a significant peak.

There may be more than one point in the data selected which gives a zero in the sliding centroid calculation, thus the messages given above may appear more than once. In determining the best estimate of the centroid, a parabolic interpolation formula is used. If there is an invalid set of data for this fit the message, "THERE IS NO VALID SOLUTION TO THE PARABOLIC INTERPOLATION FORMULA. THIS CENTROID SKIPPED" is printed and the zero is ignored. If any significant centroid is found then the centroid calculation results in the weighted average value of all significant centroid locations. This location and the weighted value of the number of σ's are listed with the message, "CENTROID CALCULATION RESULTS" followed by the time (day, fraction) data bin number, azimuth (mod. 360), status for the azimuth, average number of counts above local background, uncertainty in this average, number of sigmas above local background. If no significant centroid is found the messages "THE DIFFERENCE DOES NOT GO THROUGH ZERO" and "NO CENTROID FIT FOR THIS PEAK" are printed.

If a centroid is found the program next fits a triangular response to the data taking the centroid fit as a first estimate for the minimum x^2 fitting procedure. After the message "BEGIN MINIMUM CHI SQUARED FIT TO TRIANGLE RESPONSE" is printed the initial parameters are listed - AMPLITUDE is in counts/bin above a fixed background (7.5 cts/sec side 1, 20.0 cts/sec side 2). BIN NUM. is the relative data bin number of the peak, CHISQRD is the value of x^2 for these parameter values. Also listed on this line are the relative bin numbers of data used in fit, the number of degrees of freedom, the number of sigmas used to test data (DIFFM) and the number of data points which are more than DIFFM sigmas away from the expected values based on the centroid fit initial parameters. If more than the statistically expected number of data points are out of range (DIFFM), then the triangle fit is suppressed. Otherwise an iterative minimum x^2 search is made, the values of AMPLITUDE, BIN NUM. and CHISQRD are printed out for each step of the search, LAMDA is a parameter of the gradient expansion algorithm used to get a decrease in CHISQRD. When minimum x^2 is found the triangle fit results are given, they are the peak time (day, fraction), the azimuth (and status), the bin number and uncertainty, the amplitude and uncertainty, x^2 per degree of freedom, the number of degrees of freedom, and the collimator width in bins. If there is no convergence of the minimum x^2 fit then a message is printed "THE TRIANGLE FIT DOES NOT CONVERGE. NO FIT MADE".

The above fits are made for each suspected peak. The end of the list of peaks is followed by the message "END OF SPIN PEAKS FILE." On a new page the "TRISIGMA SUMMARY" is printed. The heading lists the program version number, the superposition period, the spin axis and the orbit numbers. Then for each peak successfully fit (either centroid or triangle) the fit results are printed. The output columns are as labeled with the following additional information. The amplitudes are in cts/sec as determined by the fit, the intensities (also in cts/sec) are the corrected intensities for known sources taking elevation effects into account. For peaks not identified with unique source the intensity is listed as zero. Backgrounds listed are local as calculated in the program; however, in the triangle fit fixed background rates are used (7.5 cts/sec side 1, 20.0 cts/sec side 2). CHISQ is per degree of freedom and the source type is "NEW" if the azimuth of the peak is more than $\pm 5\sigma$ away from any known source. "NO." is the number of known sources with azimuths within $\pm 5\sigma$ of the peak.

P750 - Spectrum Analysis

The output is arranged in order of the azimuth angle of the source as listed in the lines file. For each pass (i.e. "crossing window") on a given source, the program will access the 8-channel pulse height analyzer (PHA) data for the central 2/3 of the collimator width and also for approximately six collimator widths on either side to calculate the background. For each pass which shows the source strong enough, one block of computer printout is produced, including:

A) A table of counts and times for each PHA channel giving (1 through 8)

1. Source counts accumulated in given TIME
2. TIME (of source cts.) given in milliseconds
3. BKGD COUNTS accumulated in given TIME
4. TIME (of bkgd. cts.) given in milliseconds
5. C/S ABOVE BKGD } source counting rate and statistical one-sigma error in counts per second
6. STD DEVIATION }

These numbers are also given for the X1 or X2 window (2-6 keV)

WARNING: Do not use channel one. It is contaminated by electronic noise.

B) TRIANGLE CORRECTION FACTOR: This is the multiplier needed if absolute counting rates or normalization factor is needed. It is normally about 1.5, reflecting the fact that only the center 2/3 of the triangular collimator response was used (full triangle would correspond to a factor of 2.0).

C) STATISTICAL ERROR OF NORM. FACTOR refers to error due just to Poisson counting statistics on the normalization coefficient of the spectral fit.

D) The best rough fit spectra are then found by a minimum-x^2 comparison of the PHA data with a table of computed spectra for a grid of values for temperature, power law, and cutoff energy. The values of x^2 for each set of parameters is displayed in a table for each spectral type:

BREMSSTRAHLUNG $\longrightarrow$ temperature: (10 to 200 by 10) x 10^{6} °K
$\downarrow$ cutoff: 0 to 4 keV by 1 keV

POWER LAW $\longrightarrow$ spectral energy index: 0.2 to 4.0 by 0.2
$\downarrow$ cutoff: 0 to 4 keV by 1 keV

BLACK BODY $\longrightarrow$ temperature: (5 to 100 by 5) x 10^{6} °K
cutoff = 0 keV

For each spectral type, the two best choices (i.e. lowest x^2) of parameters are printed out, along with the predicted counting rate. It should be noted that only channels 2-8 are used in the fit, due to excess noise in channel 1.

For each pass in which the source was not strong enough to allow a spectral fit, the counts observed in both the crossing window and the background in channels 1 8 and the respective accumulation times (in milliseconds) are printed in an abbreviated format: bkgd channels 1-8, bkgd X1 or X2, source time, source channels 1-8. (No background subtraction is done at this point.)

For all passes on a given source, the source and background counts are accumulated and a spectrum is fit to the summed data. The format is the same as for a single pass. This summed spectra is the last one printed out with the given azimuth angle. (It can also be recognized by the greatly increased exposure times.)

It should be noted that due to the coarseness of the grid used and lack of pulse shape discriminator efficiency corrections, the results of the rough fit should not be used as quantitatively correct. A more detailed study of source spectra requires feeding the counting rate and sigma values listed into the FINEFIT spectrum program. It should also be noted that an auxiliary spectrum program exists which can substitute for P750 when much of the rest of the SAS data system (e.g. aspect solution) has not been run (see Memo EJS-26).

P760 - Energy Calibration

The first page of the calibration program gives the start and stop times of the superposition period

'LIST OF SUBCOM GAPS FROM_____TO_____'.

Then follows a list of subcom gaps and gaps introduced in the superposition. This table corresponds to the table of page two of the superposition.

The second page is divided into two tables, 'LOOKING AT SKY' and LOOKING AT EARTH'. The background is calculated using the spin before or the spin after. The BACKGROUND COUNTS and TIME in milliseconds and the CALIBRATION COUNTS AND TIME are given for each side.

Page three gives the data and the sun angle. The data qualified by CALX and what follows that is for diagnostic purposes and is of no importance to the user. The next useful printout starts with DAY where day is in universal time since Jan 0, 1970. What follows is:

SIDE	just side 1, then side 2
ENERGY CORRECTION FACTOR	number close to 1, relative gain or pulse height analyzers compared to nominal pre-flight measured value. It is required for use in FINEFIT spectrum program.
NORMALIZATION FACTOR	conversion factor from assumed intensity to observed counts and computed by minimum chi square.
CHI SQUARE	minimum chi square for fit.

Then for each of the eight channels and side one and/or side two is given:

CENTRAL ENERGY	midpoint of energy band in keV
CHANNEL WIDTH	full width of channel in keV
OBS. COUNTS	counts above background accumulated during calibration interval

ERROR	uncertainty in counts
PREDICTED COUNTS	best fit to the data based on findings of the system, with small modifications based on prelaunch on ground calculations.

P910 - XRAYDUMP

The output of the XRAYDUMP program is a time sequenced listing of UHURU telemetry data. The following information is contained in the output. Day of data, time of telemetry syllable in seconds, frame no., flags for frame sync, bit slip and quality word errors, X1 and X2 counts by channel, pulse height analyzer data (PH1, PH2).

If there are any 'ones' in the flags, the data contains errors. If the flags are all 'zero', there can still be noise spikes, since not all errors are detected by checks on the frame sync, bit slip or quality word ("parity").

P920 - Plot Raw Star and X-ray Data

Each 12 minutes of data is plotted on an 18" long plot. At the left of the plot the orbit number and the start time of the plot are printed out. The 12 minutes of data are divided into 4 segments of 3 minutes each and are plotted one above the other. The following data are contained in the plot:

X1: $1/2^{\circ}$ collimator, integral window 2.4 to 6.9 keV, actual counts every 0.096 sec are plotted on a scale of 25 counts per half inch. This corresponds to 260.4 cts/sec per half inch, with saturation of the plot occurring at this level.

S1: Aspect sensor on the $1/2^{\circ}$ collimator side of the experiment. Digital levels from 0 to 10 are plotted every 0.048 seconds. Levels from 11 to 15 are saturated on the plot at level 10, corresponding to a half inch. The aspect information contains both star and sun sensor data which can usually be distinguished from each other by pattern recognition. Stars give 3 pulses of order .15 sec duration with the first and third pulse separated by 10 seconds at the nominal 0.5°/sec spin rate. The sun gives as many as 18 pulses of order 1 sec duration spread over 90 seconds at the nominal 0.5° spin rate. Sun pulses generally saturate in amplitude, while the height of star pulses depends on the individual star magnitudes.

X2: 5° collimator, integral window 2-6 keV. Actual counts every 0.384 seconds are plotted on a scale of 100 counts per half inch. This corresponds to 260.4 cts/sec per half inch with saturation of the plot occurring at this level.

S2: Aspect sensor on the 5° collimator side of the experiment. Plot same as S1.

Note that the times on the plot itself at the left of each segment and along the axes, are accurate, and the 3 and 12 minutes quoted above are only approximate to order 1 or 2 seconds.

P930 - Hex Dump of T/M Disk

Output: Output is fairly self-explanatory. One line is printed per minor frame giving the following information:

UT time in seconds of day (page header gives the day number of the mission. Days are numbered sequentially since January 0, 1970).

Minor frame number (within the major frame)

Whether the status bits for the frame indicate realtime (RT) or playback (PB) data.

Number of sync errors in the data (column is headed SE).

Number of bit slip errors in the data (Column is headed BS).

The requested syllables in hexadecimal (each column is headed with the syllable number).

The first ten bits of the STATUS_ADD field created by the tape-to-disk program (P100). This field gives data quality information.

Bit 1 on indicates that this is the last frame before a data gap.

Bit 2 on indicates that this is the first frame after a data gap.

Bit 3 on (SHOULD NOT APPEAR IN THIS PRINTOUT) dummy frame.

Bit 4 on Frame has frame sync errors.

Bit 5 on Frame has bit slip errors.

Bit 6 on Unused

Bit 7 on Definite parity error in first half of frame

Bit 8 on Definite parity error in second half of frame

Bit 9 on undeterminable parity in first half of frame

Bit 10 on undeterminable parity in second half of frame.

In addition there is a self-explanatory line, containing major frame number, for each major frame.

UHURU DATA SET DESCRIPTION

NAME: SASA. P100. ORBITNX. &R
(where &R must be replaced by the (starting) orbit number for the data group.)

SOURCE AND PURPOSE:

This data set is used as an index to randomly access the minor frame data and the subframe data set[1] of the data group and is generated by P100 (the tape-to-disk program) as it derives these two other data sets from the telemetry tape.

In the production UHURU system, this data set is written by P100, the tape-to-disk program. It is read by

P110	Orbit index listing program
P130	Ephemeris tape-to-disk program
P230	Star identification program
P260	Rotational equation of motion program
P300	X-ray superposition program
P500	Crossing window program
P600	Three sigma processing program
P750	Spectrum analysis program
P760	Energy calibration program

FORMAT:

This data sets contains one record for each orbit in the data group. Each record contains the following information:

ACTUAL ORBIT _ ID

The five digit orbit number for this orbit

UTORB_START

The starting time for this orbit[2] in days and fraction of a day since January 0, 1970.

STATION_NO.

The station number is usually given as -5 for concatenated data, the normal case.[3] If only data from a single station was used for this batch, the identifying number for that station is given. During tape recorder operation the number 5 was given.

The three items below are used as indices for referencing the minor frames file.

The first minor frame of the first orbit of the batch is numbered 1. The minor frames are numbered consecutively within each orbit, and dummys are inserted in place of any missing minor frames and assigned numbers; thus, within each orbit, there is a continuous linear correspondence between time and minor frame number. Dummy minor frames are not supplied, however, for the gap between orbits. The first minor frame of each orbit after the first orbit of the batch is numbered one plus the number of the last minor frame of the previous orbit.

The minor frame data set is sequentially organized in one-track records with each track containing 30 minor frames. To retrieve a particular minor frame from disk, one can compute the corresponding record number as

$$\text{record number} = \text{integral part of } \left(\frac{\text{minor frame number}}{30} \right) - 11$$

MINOR_FRAME_LO
The first minor frame number for this orbit

MINOR_FRAME_HIGH
The last minor frame number for this orbit

MINOR_FRAME_MAX
The number of minor frames in this orbit

The following three items are used as indices in referencing the subframe data set in a manner similar to that used for referencing the minor frames. Since this data set is not presently used, I will not go into further detail.

SUB_FRAME_LO

SUB_FRAME_HI

SUB_FRAME_MAX

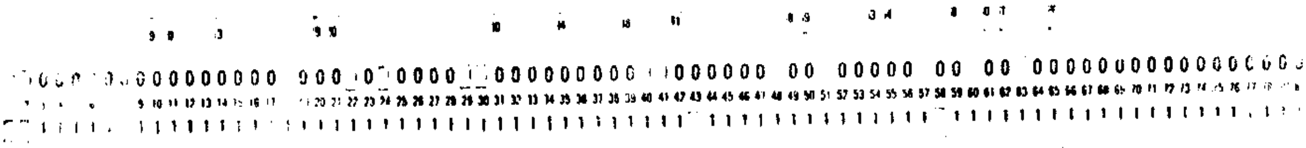
ORBIT_STATUS

This item contains 16 bit flags. It was included by the person who originated the format of this data set in case it would be needed later. I am not sure if any of the bits are used or what they are used for.

Physical Format:

The DD statement usedin writing this data set is:

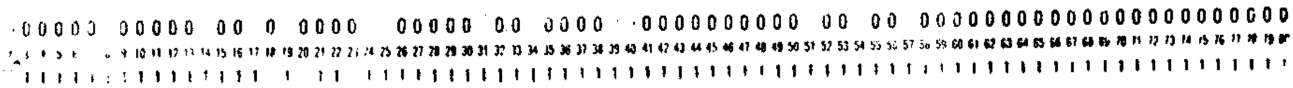
```
DD DSN=SASA.P100.ORBITINX. VOL=REF=.ASA.R&R,DISP=(,KE
PECL=45,BLK LE=450,RECFM=F LPA ,PLSE
```



where &R represents the data group (starting orbit) number, and &ORB represents the number of tracks needed for the data set.

A DD statement suitable for reading this data set is

```
DD .0.ORBITINX.R VOL=REF=R&R,DISP=SHR
```

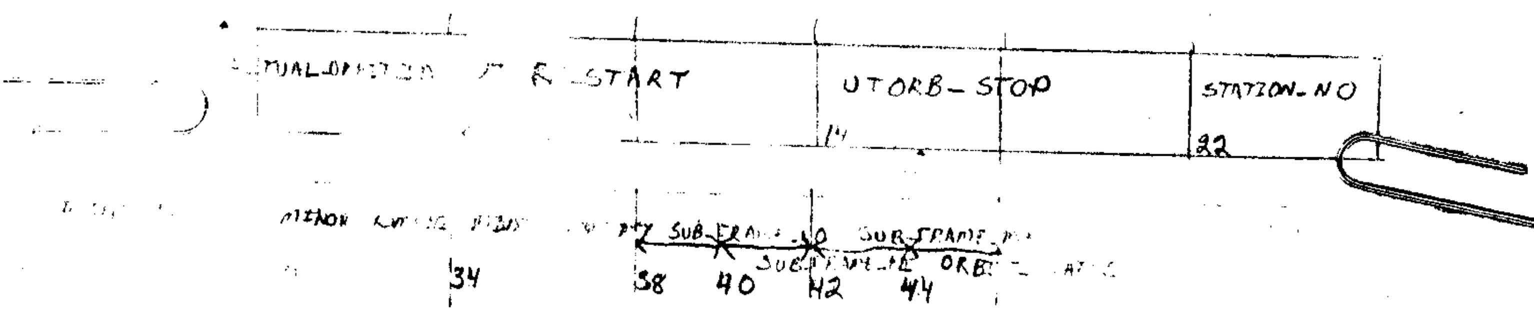


where &R represents the data group number

The record format for this data set is given by:

SASA.PICC.ORBITINX.R

```
DECLARE ORBINX FILE OUTPUT RECORD SEQUENTIAL;                      DKW01000

DECLARE 01 ORBIT_DEFINITION ALIGNED,                               DKW00920
        02  ACTUAL_ORBIT_ID CHARACTER(5),                          DKW00930
        02) (UTORB_START, UTORB_STOP) FLOAT BINARY(53),            DKW00940
        02  STATION_NO FIXED BINARY (15),                          DKW00950
        02 (MINOR_FRAME_LO, MINOR_FRAME_HI, MINOR_FRAME_MAX) FIXED DKW00960
             BINARY(31,0),                                         DKW00970
        02 (SUB_FRAME_LO, SUB_FRAME_HI, SUB_FRAME_MAX)FIXED BINARY(15),DKW00980
        02  ORBIT_STATUS_BIT(16);                                  DKW00990
```



NOTE 1: The subframe data set is not used in the UHURU production system

NOTE2: While the tape recorder in the spacecraft was working,the starting and stopping times were those associated with the beginning and end of the data in the tape recorder load. Since tape recorder failure, the starting time represents the time during this orbit that the Quito station (number 005) started receiving good telemetry, and the stopping time represents the time when the last station before Quito received its last good frame of telemetry.

NOTE 3: The spacecraft tape recorder was operational during about the first 700 orbits. During this time, as the spacecraft passed the Quito station, it would dump the accumulated data for the last orbit. After tape recorder failure, data from the spacecraft has been collected in real time at each of the approximately half dozen stations. "Concatenated data" refers to the combined real-time telemetry from these stations.

UHURU Data Set Descriptions

INDEX

Raw Telemetry Tape ✓

Ephemeris Tape NO

P100.MINFRAME.R&R ✓
P100.ORBITINX.R&R ✓
P100.SUBFRAME.R&R ✓
P100.SUBGPSX1.R&R ✓
P100.SUBGPSX2.R&R ✓
P130.EPHEMRIS.R&R ✓
P220.STRINPT.R&R NO
P230.FINPOINT.R&R ✓
P230.RGHPOINT.R&R ✓
P260.EQMCNTS.R&R ✓
P260.SUPINTVS.R&R ✓
P300.CURNTSUP.R&R ✓
P300.XSPINPKS.R&R ✓
P300.XSUPDATA.R&R ✓
P300.X1GSCMB.R&R ✓
P300.X1GPSIND.R&R ✓
P300.X2GPSCMB.R&R ✓
P300.X2GPSIND.R&R ✓
P400.CONTLIN.R&R ✓
P400.XXSKYSUM.R&R ✓
P500.FLAREPKS.R&R ✓
P600.THREESIG.R&R ✓

UHURU DATA SET DESCRIPTION

NAME: Raw Telemetry tape

SOURCE & PURPOSE:

The raw telemetry tape is generated by NASA-GSFC. It contains the raw data from the spacecraft, as recorded by the tracking stations. NASA assigns UT times to the data, subcommutates the subom data, and adds identifying information such as orbit number, station number, etc. The tape may be either written at GSFC and sent to AS&E over telephone lines or written here by the PDP-9. In the production UHURU system, this tape is read only by P100, the tape-to-disk program.

FORMAT:

Tapes written at GSFC are 7 track; those written at AS&E are 9 track, where each 8-bit character has the two leading bits set to zero. In either case, the tape appears to the computer to be a 7 track tape when read. Therefore the format is described in those terms.

The tape consists of several files, separated from one another by tape marks. Each file contains the data from a single pass over a tracking station in a single mode (realtime or playback). There are four tape marks after the last file. Prior to tape recorder failure, there are often two realtime data files per pass. After tape recorder failure, all the data is realtime and there is always one file per pass.

Each record contains 1152 6-bit characters. There are 4 types of records:

1. Tape ID record - appears at the beginning of each tape
2. File ID records - appears at the beginning of each file (also referred to as "orbit header record")
3. Minor frame record - contains 8 minor frames of telemetry data, plus associated times and flags
4. Subcom record - contains subcommutated data from a single major frame.

The record formats are as follows:

1. Tape ID Record

6-Bit Characters	Information	Comment
1-5	International Code	Satellite # label
6-9	Edit Tape #	Sequential order of tapes written by IPD (not necessarily chronological)
10-11	Year of Digitation(70,71)	at IPD
12-14	Day of Digitation(1-365)	
15-16	A/D Operator ID	at IPD
17-18	A/D Line #	at IPD
19	"0" for Experimenter's Tape	
20-1152	Blanks (60)	

2. File Id Record

6-Bit Characters	Information	Comment
1-2	Edit File Number	File # within present tape
3-6	Analog Tape Number	1 to 9999
7-8	Analog File Number	1 to 99
9-11	Station Number	
12-17	Date of Recording(YYMMDD)	at ground Station
16	Shift Number	
19-22	Analog Start Time(HHMM)	At ground station
23-26	Analog Stop Time	GMT
27-31	Orbit Number	
32-35	Clock Calibration ($\pm$XXX)	If possible
36-39	Clock TapeCharacter	
40-1152	Blanks (60_8)	

3 Minor Data Record

8 Minor Frames of Data (each 140 characters) followed by 192 Zero Bits

Minor Data Frame

Characters	Information
1-128	Minor Frame (96 syllables of data)
129-132	Data Status
133-140	Ground Time ~~(format shown above)~~

Data Status

Bit #		Information	
1,2,3		Data Type 0=R/T 1=P/B	Stop Commutator Flags
4-9		Minor Frame Counter 0-63	
10	Time flags	=Time decoder F2	
11		≠0	Minor Frame counter corrected
12		≠0 ⇒	Ground Time corrected
13-18		Frame Sync Errors	
19-24		Bit Slip Information	

All frame syncs are adjusted to be perfect if necessary by GSFC after frame sync errors counted.

4. Subcom Record

Characters	Information
1-140	Start of Sequence Identifier (see below)
141-280	AS&E Subcom Frame
281-420	APL Subcom Frame #1
421-560	APL Subcom Frame #2
561-700	Digital Subcom Frame #1

Characters	Information
701-840	Digital Subcom Frame #2
841-980	DM Frame #1
981-1020	DM Frame #2
1010-1152	Zeroes

Start of Sequence Identifier

Characters	Information
1-4	Inverted Minor Frame Sync Pattern
5-8	1st Minor Frame Count (right adjusted)
9-12	Last Minor Frame Count (right adjusted)
13-~~36~~ 140	Zero Fill

SE,APL,etc. Subcom Frame

Characters	Information
1-4	Frame Sync Pattern
5-92	Subcom Data: 512 bits & last 16 bits zero fill
93-124	Data Types 0 for R/T for P/B and stop com. Flags for each minor frame
125-128	Zero Fill
129-132	Major Frame Counter 20 bits (right adjusted)
133-140	Ground Time at Start of Major Frame

In a normal sequence (no data dropouts), each file (after the file ID record) is arranged as follows:

Subcom record

8 minor frame records

Subcom record

8 minor frame records

etc.

If there is a data dropout , the remainder of the minor frames in the record will be padded with 20_8 characters. If the dropout occurs at the end of a minor frame record, there will follow a record consisting entirely of 20_8 characters. If the data is picked up within the same major frame, the following record will be another minor frame record, starting with the first good minor frame, whether or not that minor frame is number (1 + a multiple of 8). Thus, in this case, minor frame #64 may not appear at the end of a minor frame record. In this case, the remainder of the last record will be padded with zeroes.

If the data after a dropout is picked up in a succeeding major frame, the dropout will be followed by a subcom record for the major frame in which the data is picked up, followed by a minor frame that begins with the first good minor frame.

The last minor frame record in a file will be filled out, if necessary, with zeroes.

UHURU DATA SET DESCRIPTION

NAME SASA.P100.SUBFRAME..&R
where &R is replaced by the (starting) orbit number for the data group

SOURCE & PURPOSE:

This data set contains the subcommutated data that has been lifted from the raw data and put into a separate data set. It is created by P100 (tape-to-disk) and it is not used by any other programs at present.

FORMAT:

Each major frame contains the subcommutated data from sixty-four minor frames; it covers a time period of 49.152 seconds.

For each batch the number of the first major frame is zero and the major frames are numbered consecutively within each orbit, with bad or missing frames padded, so that within each orbit the time and major frame number increase linearly. Dummy major frames are not supplied for gaps between orbits. Starting with the second orbit, the first major frame of an orbit is the number of the last major frame of the previous orbit plus one. The first subcom frame and the last subcom frame of each orbit will not have sixty-four minor frames corresponding to them unless the start and stop times of the orbit land on a subcom boundary.

Each record contains the following information:

UT the beginning time of the frame in days and fraction of a day since January 0, 1970

MAJOR_COUNT number of subcoms on tape

MINOR_COUNT_START zero

MINOR_COUNT_END sixty-three

MINOR_POINT not filled in

SUBCOMS

PHYSICAL FORMAT:

DD for writing:

```
//SUBFIL DD DSN=SASA.P100.SUBFRAME.R&R,VOL=REF=SASA.R&R,
//  SPACE=(CYL,(&SUB,01),RLSE),DISP=(,KEEP,DELETE)
```

where &R represents the orbit number for the data group and &SUB is the number of CYL needed for the data set.

DD for reading:

```
//SUBFIL DD DSN=SASA.P100.SUBFRAME.R&R,VOL=REF=SASA.R&R,DISP=SHR
```

where &R represents the orbit number for the data group

Record Format

```
DECLARE SUBFIL FILE RECORD SEQUENTIAL KEYED OUTPUT ENVIRONMENT (F(472)
        REGIONAL(1));

DECLARE 01 SUBFRA ALIGNED, 02 (UT FLOAT BINARY(53), (MAJOR_COUNT,
       MINOR_COUNT_START, MINOR_COUNT_END) FIXED BINARY(24,0),
          MINOR_POINT FIXED BINARY(31,0), SUBCOMS(7,64) BIT(8));
```

MAJOR_COUNT	MINOR_COUNT	MINOR_COUNT_NO	MINOR_[illegible]
9	13	[illegible]	21

[illegible]						
[illegible]						
[illegible]						
[illegible]						
subcom([illegible])						
[illegible]						
[illegible]						
[illegible]						
subcom(5,1)						
subcom(5,[illegible]) 313						
subcom([illegible])						
subcom(0,33)						

UHURU DATA SET DESCRIPTION

NAME: SASA. P100. MINFRAME. &R
(where &R is replaced by the (starting) orbit number for the data group

SOURCE & PURPOSE:

This data set is generated by P100 (the tape-to-disk program) from the raw data tape. This data set contains the raw data from the spacecraft, that is, the date from the star sensor, the sun sensor, and the X-ray sensors and the sub-commutated data.

In the production UHURU system, this data set is written by P100, the tape-to-disk program. It is read by

P230	star identification program
00	X-ray superposition program
00	three sigma processing program
P750	spectrum analysis program
P760	energy calibration program

FORMAT:

This data set is usually accessed through the subroutine DRECTAC and TLRECD on SASA. LOAD rather than directly. This relieves the user of the responsibility of figuring out the blocking factor; he uses it as if it were unblocked. DRECTAC is for random access, that is, when only the time is known. TLRECD is for sequential access, that is, when the minor frame number is already known.

Each minor frame is .768 seconds long and contains 8 samples of X-1, 4 samples of PH1-1-8, 2 samples of X-2 and PH2-1-8, 16 samples of aspect data, and 1 sample of housekeeping data. 64 minor frames = 1 Major frame

For each batch the number of the first minor frame is one and the minor frames are numbered consecutively, within each orbit, with bad or missing frames padded, so that, within each orbit the time and minor frame number increase linearly. Dummy minor frames are not supplied for gaps between orbits. Starting with the second orbit, the first minor frame of an orbit is the number of the last minor frame of the previous orbit plus one.

The minor frame data set is sequentially organized in one track records with each track containing 30 minor frames. To retrieve a particular minor frame without using DRECTAC or TLRECD the record number is equal to the integral part of minor frame number minus one divided by 30. Actually this particular record size means there is one record per track on the 2311, two records per track on the 2314.

Each record contains the following information:

UT is the beginning time of the frame in days and fraction of a day since Jan.0,1970
MAJOR POINT is the number of the subcom frame that corresponds to the minor frame.
STATUS contains the minor frame number within the major frame and the frame sync errors. This information is used in the tape-to-disk program, but need not concern the users.

STATUS_ADD

```
*****************************************************************************
/* BITS IN STATUS_ADD ARE SET 1 WHEN THE FOLLOWING CONDITIONS HOLD:        */
/*                                                                         */
/*    BIT                       CONDITION                                  */
/*                                                                         */
/*     1   LAST GOOD MINOR FRAME BEFORE DATA GAP; MAY HAVE PARITY SET      */
/*     2   FIRST GOOD MINOR FRAME AFTER DATA GAP; MAY HAVE PARITY SET      */
/*     3   DUMMY FRAME WITH CALCULATED EMBEDDED TIME                       */
/*     4   MINOR FRAME WITH FRAME SYNC ERRORS; TIME CORRECTED              */
/*     5   MINOR FRAME WITH BIT SLIP ERRORS; TIME CORRECTED                */
/*     6   (CURRENTLY UNUSED)                                              */
/*     7   DEFINITE PARITY ERROR IN FIRST HALF OF MINOR FRAME              */
/*     8   DEFINITE PARITY ERRORS IN LAST HALF OF MINOR FRAME              */
/*     9   UNDETERMINABLE PARITY IN FIRST HALF OF MINOR FRAME              */
/*    10   UNDETERMINABLE PARITY IN LAST HALF OF MINOR FRAME               */
/*  11-24 (CURRENTLY UNUSED)                                               */
```

FRAME

Frame Format

WORD	SYLLABLE 1	SYLLABLE 2	SYLLABLE 3
1.	FRAME SYNC	FRAME SYNC	FRAME SYNC
2.	X-1		ASPECT
3.	PH1-1	PH2-1	PH1-2
4.	PH2-2	PH1-3	ASPECT
5.	PH1-4	FRAME IDENT.	PH1-5
6.	X-1		ASPECT
7.	PH1-6	PH2-3	PH1-7
8.	PH2-4	PH1-8	ASPECT
9.	X-2		APL HSKPG. SAMPLE #1
10.	X-1		ASPECT
11.	PH1-1	PH2-5	PH1-2
12.	PH2-6	PH1-3	ASPECT
13.	PH1-4	DM	PH1-5
14.	X-1		ASPECT
15.	PH1-[illegible]	PH2-7	PH1-7
16.	PH2-8	PH1-8	ASPECT
17.	DSC #1	DSC #2	AS&E HSKPG.
18.	X-1		ASPECT
19.	PH1-1	PH2-1	PH1-2
20.	PH2-2	PH1-3	ASPECT
21.	PH1-4	PARITY CHECK	PH1-5
22.	X-1		ASPECT
23.	PH1-6	PH2-3	PH1-7
24.	PH2-[illegible]	PH1-8	ASPECT
25.	X-		APL HSKPG. SAMPLE #2
26.	X-1		ASPECT
27.	PH1-1	PH2-5	PH1-2
28.	PH2-6	PH1-3	ASPECT
29.	PH1-4	DM	PH1-5
30.	X-1		ASPECT
31.	PH1-6	PH2-7	PH1-7
32.	PH2-8	PH1-8	ASPECT

Physical Format:

DD card for writing

```
//MINFRA DD DSN=SASA.P100.MINFRAME.R&R,VOL=REF=SASA.R&R,
//  SPACE=(CYL,(&MIN,05),RLSE),DISP=(,KEEP,DELETE)
```

where &R is the orbit number and &MIN is the number of cylinders required for the data set.

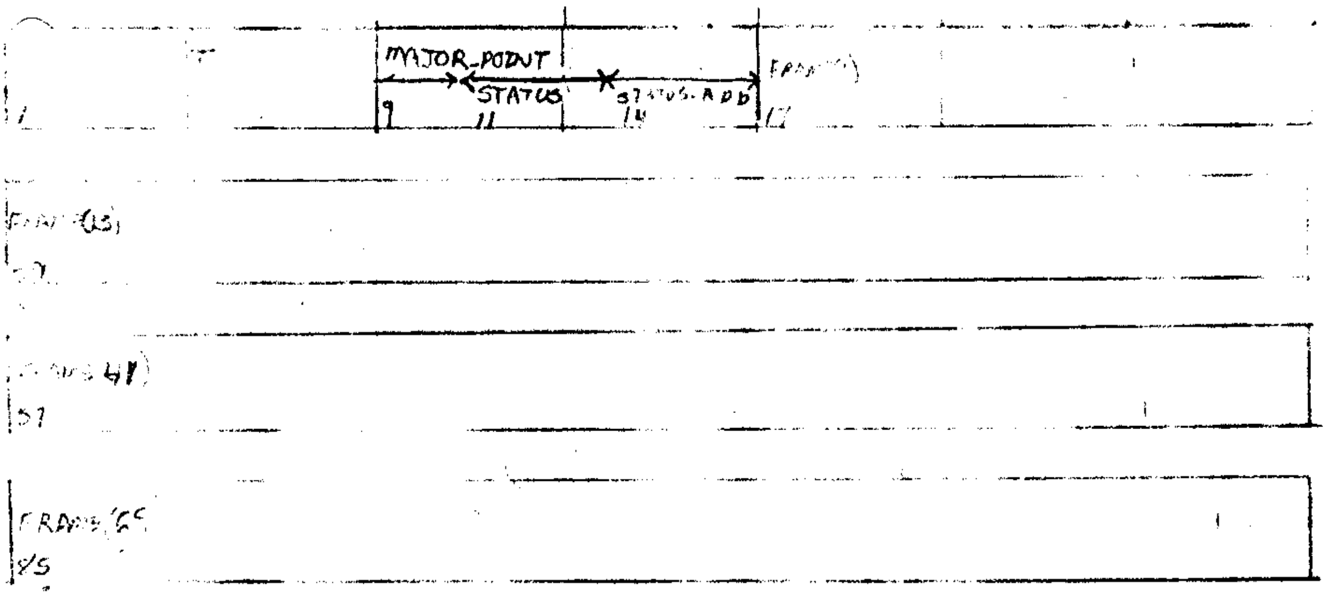
DD card for reading

```
//MINFRA DD DSN=SASA.P100.MINFRAME.R&R,VOL=REF=SASA.R&R,DISP=SHR
```

where &R is the orbit number

Record Format

```
DECLARE MINFRA FILE RECORD KEYED ENVIRONMENT (F(3360) REGIONAL (1));
DECLARE 01 MAIN_DISK_RECD ALIGNED, 03 MAINFRX(30) ALIGNED,
          05 ( UT FLOAT BINARY(53),  MAJOR_POINT,
          STATUS BIT(24), STATUS_ADD BIT(24),
          FRAME (96) BIT(8));
```



16
6
12
21
bit
×2

NAME: SASA.P100.SUBGPSX1.R&R
SASA.P100.SUBGPSX2.R&R

SOURCE & PURPOSE: P100, the tape-to-disk program, checks each subcom record as it goes from the tape to the disk for bits indicating the logic and power switching state of the instrument. If one of these conditions exists, the data is not used in superposition. This file is input to P300, the superposition program.

FORMAT: There is one record for each subcom gap. There is a separate file for each side. The format of each record is

UT1 — the start time in days and fraction of a day since January 0, 1970; it is 8 times .768 sec before the bit first appears

UT2 — the end time in days and fractions of a day since January 0, 1970; it is 8 times .768 secs after the bit last appears

TYPEGAP1
- Bit 1 on Long Calibration
- Bit 2 on short calibration
- Bit 3 on radioactive calibration
- Bit 4 on PSD disabled
- Bit 5 on background disabled
- Bit 9 on PHA serial
- Bit 10 on side switched

DD for writng (MOD file preallocated in earlier step)

~~File definition~~

```
//[illegible] DD DSN=SASA.P100.SUBGPSX1.R&R,VOL=REF=SASA.R&R,DISP=(,KEEP),
//   DCB=(LRECL=18,BLKSIZE=180,RECFM=FB),SPACE=(TRK,(&GAP,1))      00001200
//[illegible] DD DSN=SASA.P100.SUBGPSX2.R&R,VOL=REF=SASA.R&R,DISP=(,KEEP),   00001300
// DCB=*.[illegible],SPACE=(TRK,(&GAP,1))                             00001400
                                                                   00001500

//GAPS1 DD DSN=SASA.P100.SUBGPSX1.R&R,VOL=REF=SASA.R&R,DISP=MOD     00001700
//GAPS2 DD DSN=SASA.P100.SUBGPSX2.R&R,VOL=REF=SASA.R&R,DISP=MOD     00001800
```

Where &R represents the orbit number for the batch and &GAP the number of tracks needed

DD for reading

```
//GAP1      DD DSN=SASA.P100.SUBGPSX1.R&R,VOL=REF=SASA.R&R,DISP=SHR,   00000250
//    DCB=BUFNO=1                                                   00000260

//GAP2      DD DSN=SASA.P100.SUBGPSX2.R&R,VOL=REF=SASA.R&R,DISP=SHR,   00000300
//    DCB=BUFNO=1                                                   00000310
```

where &R represents the orbit number for the batch

File Definition

```
    DECLARE GAPS 1 FILE RECORD SEQUENTIAL,
            GAPS 2 FILE RECORD SEQUENTIAL;

DECLARE  01 GAPREC1 ALIGNED,     /*  X1 SIDE */                FIND2480
         02 (UT1,UT2)          FLOAT BINARY(53),               FIND2490
         02 TYPEGAP1           BIT(16),                        FIND2500
         01 GAPREC2 ALIGNED, /*** X2 SIDE ***/                 FIND2510
         02 (UT1,UT2)          FLOAT BINARY(53),               FIND2520
         02 TYPEGAP2           BIT(16);                        FIND2530
```

UT1	9 UT2	17 TYPEGAP1	

UHURU DATA SET DESCRIPTION

NAME: SASA. P130. EPHEMERIS. R&R

where the five digit (starting) orbit number must replace &R

SOURCE & PURPOSE:

The ephemeris tape-to-disk, P130 reads the tape supplied by GSFC and extracts the required ephemeris data for the time interval included in the data group. This file is called SASA. P130. EPHEMERIS. R&R. This file can be accessed by use of GETEPH. This file is used by P230 and P300.

FORMAT:

There is one record per minute for the orbit group. The format of the record is as follows:

OUTTIME	day in days and fraction of a day since January 0, 1970
POSITION(3)	the coordinates of the position of the satellite in celestial coordinates relative to the earth
VELOCITY(3)	the velocity vector of the satellite

PHYSICAL FORMAT:

DD card for writing

```
//EPHEM DD DSN=SASA.P130.EPHEMRIS.R&R,VOL=REF=SASA.R&R,DISP=(,KEEP),
// DCB=(RECFM=FB,LRECL=32,BLKSIZE=320),SPACE=(TRK,(&EPH,20),RLSE)
```

where &R is the orbit number and &EPH is the number of tracks needed for the data sets.

DD card for reading

```
//EPHEM  DD DSN=SASA.P130.EPHEMRIS.R&R,VOL=REF=SASA.R&R,DISP=SHR
// DCB=BUFNO=&BUF
```

where &R is the orbit number and &BUF is the number of buffers.

File Definition

```
DECLARE EPHEM FILE RECORD SEQUENTIAL;
  OUTPUT,
  2  OUTTIME FLOAT BINARY(53),
  2  POSITION(3) FLOAT   BINARY,
  2  VELOCITY(3) FLOAT   BINARY;
```

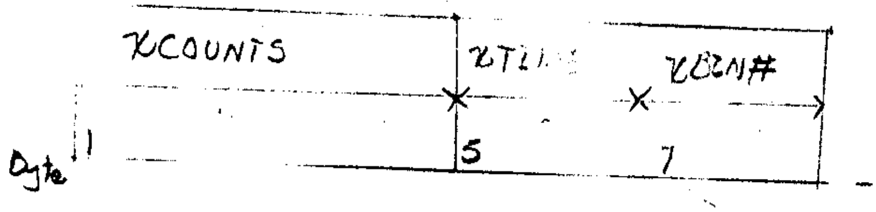
OUTTIME		POSITION(1)	POSITION(2)	POSITION(3)	VELOCITY(1)	VELOCITY(2)	VELOCITY(3)
1		9	13	17	21	2[illegible]	27

Byte

SOURCE & PURPOSE

A superposition interval is defined by the equation of motion as a time period in which the satellite spin axis does not drift more than 3° on the sky so that the data from successive spins may be summed. The average 360° circle scanned by the detector during a superposition is broken into 4320 (1080) elements of azimuth of 5'(20') each for the $1/2^{\circ}(5^{\circ})$ detector.

Each X-ray data word is added to the array element corresponding to the location on the sky of the detector at the time the data word was collected as calculated from the equation of motion solution. In this way, the X-ray data are superimposed over many spins of the satellite. The result is an array of count rate versus azimuth with total exposure of order one day and this is written out as SASA. P300. XSUPDATA. R&R.



UHURU DATA SET DESCRIPTION

NAME: SASA. P300. X1GPSCMB. R&R
SASA. P300. X2GPSCMB. R&R
(where the five character ((starting)) orbit must replace &R)

SOURCE & PURPOSE :

P300, the superposition program, combines the subcom gaps from the tape-to-disk program (SASA. P100. SUBGPSX1. R&R and SASA. P100. SUBGPSX2. R&R) with the manual gaps, the earth-blocking gaps and South Atlantic anomaly gaps. These last two kinds of gaps are found by using COORDS, which calculates the direction of the X-ray detectors using the output from the equation of motion (SASA. P260. EQMCNSTS. R&R). These gaps are written out with each type of gap flagged (SASA. P300. X1GPSIND. R&R and SASA. P300. X2GPSIND. R&R) and with all types merged. These gaps cover the time interval given in SASA. P300. CURNTSUP. R&R. They are used by P500, the cross-window program to eliminate bad times from the crossing window it puts in SASA. P400. CURNLIN.R&R

FORMAT:

TIME1 the start time in days and fraction of a day since January 0, 1970

TIME2 the stop time in days and fraction of a day since January 0, 1970

file definition

```
DECLARE XRGAP1 FILE RECORD SEQUENTIAL,
        XRGAP2 FILE RECORD SEQUENTIAL;
```

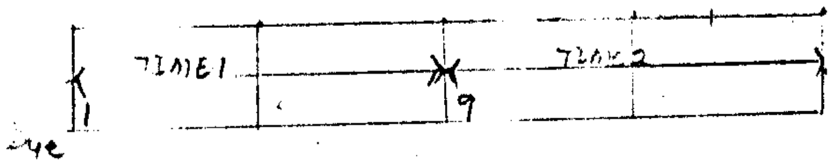
```
DECLARE 01 TIMES STATIC,
        02 (TIME1,TIME2) FLOAT BINARY (53);
```

DD cards for writing

```
//XRGAP1   DD &CUM.DSN=SASA.P300.X1GPSCMB.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(BLKSIZE=0160,LRECL=0016,RECFM=FB,BUFNO=1),
//   SPACE=(TRK,(01,1),RLSE),DISP=(NEW,KEEP)
//XRGAP2   DD &CUM.DSN=SASA.P300.X2GPSCMB.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(BLKSIZE=0160,LRECL=0016,RECFM=FB,BUFNO=1),
//   SPACE=(TRK,(01,1),RLSE),DISP=(NEW,KEEP)
```

DD cards for reading

```
//XRGAP1 DD DSN=SASA.P300.X1GPSCMB.R&R&SUF,VOL=REF=SASA.R&R,DISP=SHR
//XRGAP2 DD DSN=SASA.P300.X2GPSCMB.R&R&SUF,VOL=REF=SASA.R&R,DISP=SHR
```



NAME: SASA. P300. X1GPSIND. R&R
SASA. P300. X2GPSIND. R&R

(where the five character (starting) orbit number for the batch must replace &R)

SOURCE & PURPOSE: P300, the superposition program, combines the sub-com gaps from the tape-to-disk (SASA. P100. SUBGPSX1. R&R and SASA. P100. SUBGPSX2. R&R) with the nominal gaps, the earth-blocking and South Anomaly gaps. These last two kinds ofgaps are found by using COORDS, which calculates the direction of the X-ray detectors using the output from the equation of motion (SASA. P260. EQMCNSTS. R&R). These gaps are written out with each type of gap flagged and also with all types merged (see SASA. P300. X1GPSCMB. R&R and SASA. P300. X2GPSCMB. R&R). These gaps cover the time interval given in SASA. P300. CURNTSUP. R&R. They are used by the spectrum program to compute background times and the calibration program to find calibration times.

FORMAT: There is one record for each subcom gap. There is a separate file for each side. The format of each record is

UT1 the start time in days and fraction of a day since January 0, 1970

UT2 the stop time in days and fraction of a day since January 0, 1970

TYPEGAP Bit 1 on long calibration

Bit 2 on short calibration

Bit 3 on radioactive calibration

Bit 4 on PSD disabled

Bit 5 on background disabled

Bit 6 on earth blocking

Bit 7 on "nothing" used for manual gaps

Bit 8 on South Atlantic anomaly

Bit 9 on PHA serial

Bit 10 on side switched

UT2 TYPEGAP1

9 17

```
DECLARE GAP11   FILE RECORD SEQUENTIAL;
DECLARE GAP22   FILE RECORD SEQUENTIAL;
DECLARE 01 GAPREC ALIGNED STATIC,                               /*70.337*/GAPS0290
        02  (UT1,UT2) FLOAT BINARY(53),                         /*70.337*/GAPS0300
        02  TYPEGAP1  BIT(16);
                                                                  GAPS3190
                                                                  GAPS3200
                                                                  GAPS3210
//      DD &DUM.DSN=SASA.P300.X1GPSIND.R&R&SUF,VOL=REF=SASA.R&R&SUF, 00000270
//  DCB=(BLKSIZE=0180,LRECL=0018,RECFM=FB,BUFNO=1),              00000280
//  SPACE=(TRK,(01,1),RLSE),DISP=(NEW,KEEP)                      00000290
//      DD &DUM.DSN=SASA.P300.X2GPSIND.R&R&SUF,VOL=REF=SASA.R&R&SUF, 00000320
//  DCB=(BLKSIZE=0180,LRECL=0018,RECFM=FB,BUFNO=1),              00000330
//  SPACE=(TRK,(01,1),RLSE),DISP=(NEW,KEEP)                      00000340
//GAP11 DD DSN=SASA.P300.X1GPSIND.R&R&SUF,VOL=REF=SASA.R&R&SUF,DISP=SHR
//GAP22 DD DSN=SASA.P300.X2GPSIND.R&R&SUF,VOL=REF=SASA.R&R&SUF,DISP=SHR
```

NAME: SASA. P400. CURNTLIN. RXXXXX

(where XXXXX represents the ((starting)) orbit number for the batch)

FORMAT:

This data set contains one record for each peak successfully fitted. Each data set contains the following information.

RA	right ascension of the line of position pivot point
DECL	declination of the line of position, pivot point
THETA	azimuth of the peak (source)
DTHETA	uncertainty in the azimuth
PHI	elevation of the source in the collimator if there is X1-X2 correlation otherwise elevation of center of collimator
DPHI	uncertainty in the elevation
SI	intensity of peak
DSI	uncertainty in the intensity
BACKGROUND	local background rate
SXV	vecor components of cross product of pivot point center vs. spin axis vector
SPECTRAL	output 1&2 Bremsstrahlung, 3&4 Power Law, 5&6 Black Body
INDEX	temperature (10 to 200 by 10) x 10^6 ^oK for Bremsstrahlung spectral energy index 0.2 to 4.0 by 0.2 for Power Law temperature (5 to 100 by 5) x 10^6 ^oK for Black Body
EC	cutoff 0 to 4 keV by 1 keV for Bremsstrahlung and Power Law 0 keV for Black Body
INTENSITY	normalization coefficient
CHISQ	chi square

the SPECTRAL output is from P750 and gives the two best fits (lowest x^2) for each spectral type

WINDOW output crossing times from P500

T_ON time on in milliseconds of day
DT length of crossing in centiseconds of day
DAY day since January 0, 1970

N_CROSS_TIMES number of individual sightings of the source (number of cross window times)

LINE_STATUS definition (LSB first):

Bit 1 on X2
Bit 2 on Binary
Bit 3 on X1-X2 correlated
Bit 4 on one peak fitted but may be extended
Bit 5 on night time data only (not accurate)
Bit 6 on production date
Bit 7 on confused region
Bit 8 not used

FILLER_CHARACTERS not used

SOURCE & PURPOSE:

SASA.P400.CURNTLIN.R&R is originated by P400, the peakfit program and additional information is added by P500. the crossing window program and P750, the spectrum program. This file contains the location in azimuth and intensity of the X-Ray sources found in the superinposed data (SASA.P300.XSUPOATA.R&R). For each line of position, P500 inverts the equation of motion to list all time intervals, or windows, when that particular line of position (azimuth) was in the field of view of each detector. These are the times within one superposition period for which there is a valid equation of motion and no subcom gaps or earth-blocking gaps. These crossing times are inserted in SASA.P400. CURNTLIN.R&R, see FORMAT. Using these times, P750 extracts the 8-channel pulse height data for each pass over the source. Then the PHA data are summed over the entire superposition Interval and a rough bit is done. The two best fits (lowest X^2) for Bremsstrahlung, Power Law, and Blackbody are stored in the lines record, see Format.

File Definition

DCL

```
CLINES FILE RECORD SEQUENTIAL;
```

```
DCL 01 LINE ALIGNED,                                                     LINE0750
     02 (RA,DECL,THETA,DTHETA,PHI,DPHI,SI,DSI,BACKGROUND),               LINE0760
     02 SXV(3),                                                          LINE0770
     02 SPECTRAL (6),                                                    LINE0780
          03 INDEX     FIXED DECIMAL(3,1),                               LINE0790
          03 EC        FIXED DECIMAL(3,1),                               LINE0800
          03 INTENSITY FLOAT,                                            LINE0810
          03 CHISQ,                                                      LINE0820
     02 XWINDOW (120),                                                   LINE0830
          03 T_ON      FIXED BINARY(31),                                 LINE0840
          03 DT        FIXED BINARY(15),                                 LINE0850
          03 DAY       FIXED BINARY(15),                                 LINE0860
     02 N_CROSS_TIMES FIXED BINARY(15),                                  LINE0870
     02 LINE_STATUS    BIT(8),                                           LINE0880
     02 FILLER_CHARACTERS CHARACTER(5);                                  LINE0890
```

DD cards for writing this file

```
//CLINES [illegible] DSN=SASA.P400.CURNTLIN.R&R&SUF,VOL=REF=SASA.R&R&SUF,   00000090
// DISP=(NEW,KEEP),DCB=(BLKSIZE=1088,LRECL=1088,RECFM=F,BUFNO=&BUF),    00000100
// SPACE=(TRK,(7,1),RLSE)                                               00000110
```

DD cards for reading this file

```
//CLINES DD DSN=SASA.P400.CURNTLIN.R&R&SUF,VOL=REF=SASA.R&R,DISP=OLD      000C
```

[illegible]	DECL	THETA	DTHETA	[illegible]	DPHI	SI	[illegible]
1	5	9	13	17	21	25	[illegible]

[illegible]	SIV(1)	SIV(2)	SIV(3)
[illegible]	[illegible]	41	45

[illegible] INTENSITY(I) [illegible]

[illegible] I=1TO6

[illegible]

[illegible] I=1TO120

[illegible]

UHURU DATA SET DESCRIPTION

NAME: SASA. P400. XXSKYSUM. R&R

(where the five digit ((starting)) orbit number replaces &R

SOURCE & PURPOSE:

The Peakfit program P400 after it has found the lines of position rewrites the SASA. P300. XSUPDATA. R&R file with the additional information that if data from a bin is part of a source in the line of position file it is so marked and if a bin contained noise that noise is suppressed, that is, the counts and time are set to zero. This output file is called SASA. P400. XXSKYSUM. R&R

FORMAT:

This data set contains a header record and then one record for each bin (4320 for side 1, 1080 for side 2). The header record contains the following information:

UT	start time of superposition period in days and fractions of a day since January 0, 1970.
ALPHA	right ascension of the spin axis
DELTA	declination of the spin axis

The other records contain the following information:

ISIDE	either 1 or 2
IBIN#	number of the bin (1 to 4320 for side one, 1 to 1080 for side two)
ITIME	number of samples of data (every .096 seconds for side one, every .384 seconds for side two)
ISOURCE	=1 if data from bin in source of line of position file =0 if no line of position from peakfit corresponds to this bin.
ICOUNTS	number of counts

NOTE: ITIME AND ISOURCE differ from corresponding items in superposition in that noise has been suppressed, these two quantities are set to zero if noise was found in this bin.

FILE DEFINITION

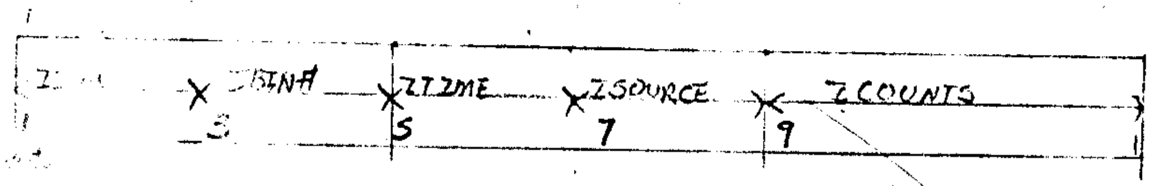
```
DCL 01 DATA_OUT              BASED (POUT),
      02 ISIDE,
      02 IBIN#,
      02 ITIME,
      02 ISOURCE,
      02 ICOUNTS              FIXED BINARY(31),
     01 HEADER                BASED (POUT),
      02 (UT1,ALPHA,DELTA)  FLOAT BINARY,
     01 TRAILER               BASED (POUT),
      02 IFILL2               CHARACTER(12);

DCL SUPXMAS FILE RECORD SEQUENTIAL;
```

DD CARD FOR WRITING

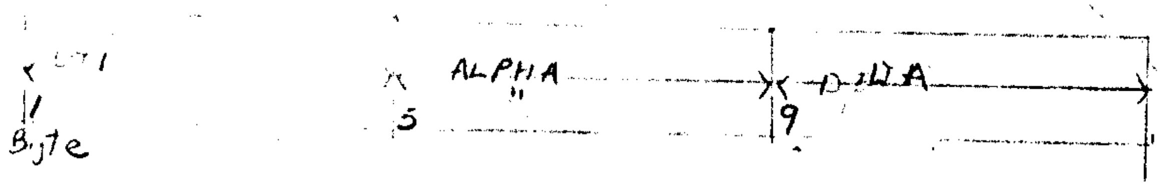
```
//SUPXMAS DD &DUM.DSN=SASA.P400.XXSKYSUM.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//    DISP=(NEW,KEEP),DCB=(BLKSIZE=1296,LRECL=12,RECFM=FB,BUFNO=&BUF),
//    SPACE=(  ,(9,1),RLSE)
```

DD CARD FOR READING

```
//SUPXMAS DD DSN=SASA.P400.XXSKYSUM.R&R&SUF,VOL=REF=SASA.R&R&SUF,
    DISP=SHR
```



HEADER



UHURU DATA SET DESCRIPTION

NAME: SASA. P500. FLAREPKS. RXXXXX

(where XXXXX represents the ((starting)) orbit number for the batch)

SOURCE & PURPOSE:

P500 checks the list of peaks (SASA. P300. XSPINPKS. R&R) to see if they are noise spikes or real peaks. A peak that appeared in only one telemetry sample would be considered noise; a peak that appears on the edge of a gap would be considered in a gap. The peaks are written in an output file SASA. P500. FLAREPKS. R&R. This was a preliminary program and this output should not be used. The three sigma program output should be looked at instead.

FORMAT:

This data set contains one record for each flare that it considers a peak successfully fitted. Each data set contains the following information:

FLARE_THETA	azimuth of peak in degrees
FLARE_TIME_ON	start time of peak in milliseconds of day
FLARE_DURATION	length of peak in milliseconds
FLARE_DAY	day since January 0, 1970
FLARE_INTENSITY	approx intensity of peak in counts per sec.
FLARE_WIDTH	approx width of the peak in bins, 1080 bins per 360° for side one, 108 bins per 360° for side two
FLARE_STATUS	'1'B side 2 '0'B side 1
FLARE_FILLER	filler characters

File Definition

```
DECLARE FLARES OUTPUT FILE RECORD SEQUENTIAL ;                      CR2S0030
```

```
DECLARE 01 FLREVT ALIGNED STATIC,                                    CR2S0110
          02 FLARE_THETA,                                            CR2S0120
          02 FLARE_TIME_ON FIXED BINARY(31),                         CR2S0130
          02 FLARE_DURATION FIXED BINARY(15),                        CR2S0140
          02 FLARE_DAY FIXED BINARY(15),                             CR2S0150
          02 FLARE_INTENSITY,                                        CR2S0160
          02 FLARE_WIDTH FIXED BINARY(15),                           CR2S0170
          02 FLARE_STATUS BIT(8),                                    CR2S0180
          02 FLARE_FILLER CHAR(5) ;                                  CR2S0190
```

DD card for writing

```
//FLARES DD DSN=SASA.P500.FLAREPKS.R&R&SUF,VOL=REF=SASA.R&R,
// DCB=(BLKSIZE=240,LRECL=24,RECFM=FB),SPACE=(TRK,(3,1),RLSE),
// DISP=(NEW,KEEP)
```

DD card for reading .

```
//FLARES DD DSN=SASA.P500.FLAREPKS.R&R&SUF,VOL=REF=SASA.R&R,
    DISP=OLD
```

Flares

UHURU DATA SET DESCRIPTION

NAME: SASA.P600.THREESIG.R&R
where the five digit (starting) orbit number replaces &R

FORMAT: This data set contains one record for each peak successfully fitted. Each data set contains the following information:

PTIME	time of peak in days and fractions of a day since January 0, 1970
SIGMA_T	error in time of peak
PTHETA	azimuth of peak in degrees
SIGMA_TH	error in azimuth of peak
PPHI	elevation of the center of the collimator in degrees
SIGMA_PHI	error in phi of peak (set to zero)
PAMP	amplitude of peak in cts/sec as determined by fit
SIGMA_PAMP	error in amplitude of peak
PINT	corrected intensity for known sources in cts/sec taking elevation effects into account. For peaks not identified with unique source the intensity is listed as zero
SIGMA_PINT	error in intensity of peak
BKGD	local background as calculated in the program
SIGMA_BKGD	error in background
SIGS	the number of sigmas above background in the peak
CHI	chi square per degree of freedom
DEGS	the number of degrees of freedom
STATUS	BIT 1 ON = NO TRIANGLE FIT BIT 2 ON = X2 (LSB FIRST)
SRCNAME	source if the azimuth of the peak is less than 5σ away

file definition

```
DCL  TRISIG FILE RECORD SEQUENTIAL;


DCL  01  OUTREC ALIGNED EXTERNAL,
         02 (PTIME,SIGMA_T) FLOAT BIN(53),
         02 (PTHETA,SIGMA_TH),
         02 (PPHI,SIGMA_PHI),
         02 (PAMP,SIGMA_PAMP),
         02 (PINT,SIGMA_PINT),
        02 (BKGD,SIGMA_BKGD,SIGS,CHI),
         02 DEGS FIXED BIN(15),
        02 STATUS BIT(2),
        02 SRCNAME CHAR(12),
        02 NSRC FIXED BIN(15);


'LEGEND:, PEAK STATUS BITS DEFINITION (LSB FIRST):',
'BIT 1 ON => NO TRIANGLE FIT',
'BIT 2 ON => X2')
```

D statement used in writing this data set

```
/RIT    DD DSN=SASA.P600.THREESIG.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//         DISP=(NEW,KEEP),SPACE=(TRK,(5,1),RLSE),
//         DCB=(BLKSIZE=656,LRECL=82,RECFM=FB,BUFNO=&BUF)
```

where R represents the batch number, SUF represents a suffix added where there is more than one superposition period. And BUF indicates the number of buffers, it is set to one if core is limited.

The DD statement used in reading the data set

```
         DD DSN=SASA.P600.THREESIG.R&R&SUF,VOL=REF=SASA.R&R&SUF,
         DCB=BUFNO=&BUF,DISP=SHR
```

SOURCE & PURPOSE: For each suspected peak (SASA. P300.XSPINPKS. R&R) from a single spin of the satellite, the telemetry data are examined to see if there is a statistically significant peak and if so the data are fit to the collimator response to determine the location and strength of the X-ray source. If the source is one contained in a reference catalog of known strong sources stored in the system, it is so identified. The significant peak are recorded in an output file called SASA-P600. THREESIG. R&R

P	SIGMA_T	THETA	SIGMA_TH	PHI	SIGMA_PHI
	13	17	21	25	29

SIGMA_PMAX	PINT	SIGMA_PINT	BKGD	SIGMA_BKG	[illegible]
	41	45	49	53	61

[illegible]	STATUS	SRCNAME	NSRC
65	67 68		81

44

UHURU DATA SET DESCRIPTION

NAME: SASA. P230. FINPOINT. R&R

(where the five digit ((starting)) orbit number must replace &R

SOURCE & PURPOSE

The star identification program, P230, identifies set of star sightings for input to the equation of motion. SASA. 230. RGHPOINT. R&R and SASA. P230. FINPOINT. R&R contain the sighting times of the accepted star pulses and star identification for input to P260.

FORMAT:

There is one record for each set. The format of the data is as follows:

JORBIT	number of orbit within processing group
JACTUAL_ORBIT	five digit orbit number
JSTARS_IN_SET	No. of identified stars in sets
FINE_ASPET(50)	information on up to 50 stars in set
STAR_UT1	time past first slit in days and fractions of a day since January 0, 1970
STAR_UT2	time past second slit in days and fractions of a day since January 0, 1970
STAR_UT3	time past third slit in days and fractions of a day since January 0, 1970
STAR_SAO#	SAO number of star
STAR_RA	right ascension of star
STAR_DEC	declination of star
STAR_MAG	visual magnitude of star
STAR_STATUS	bit 8 on sensor side 'B' off sensor side 'A'

DD cards for writing (MOD file)

```
//DD2 DD &DUM.DSN=SASA.P230.FINPOINT.&R&SUF,VOL=REF=SASA.R&R&SUF,
// DCB=(BLKSIZE=2403,LRECL=2403,RECFM=F),SPACE=(TRK,(9,9)),DISP=(,KEEP)

//                  DSN=SASA.P230.FINPOINT.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//                  3,LRECL=2403,RECFM=F,BUFNO=&BUF),DISP=MOD
```

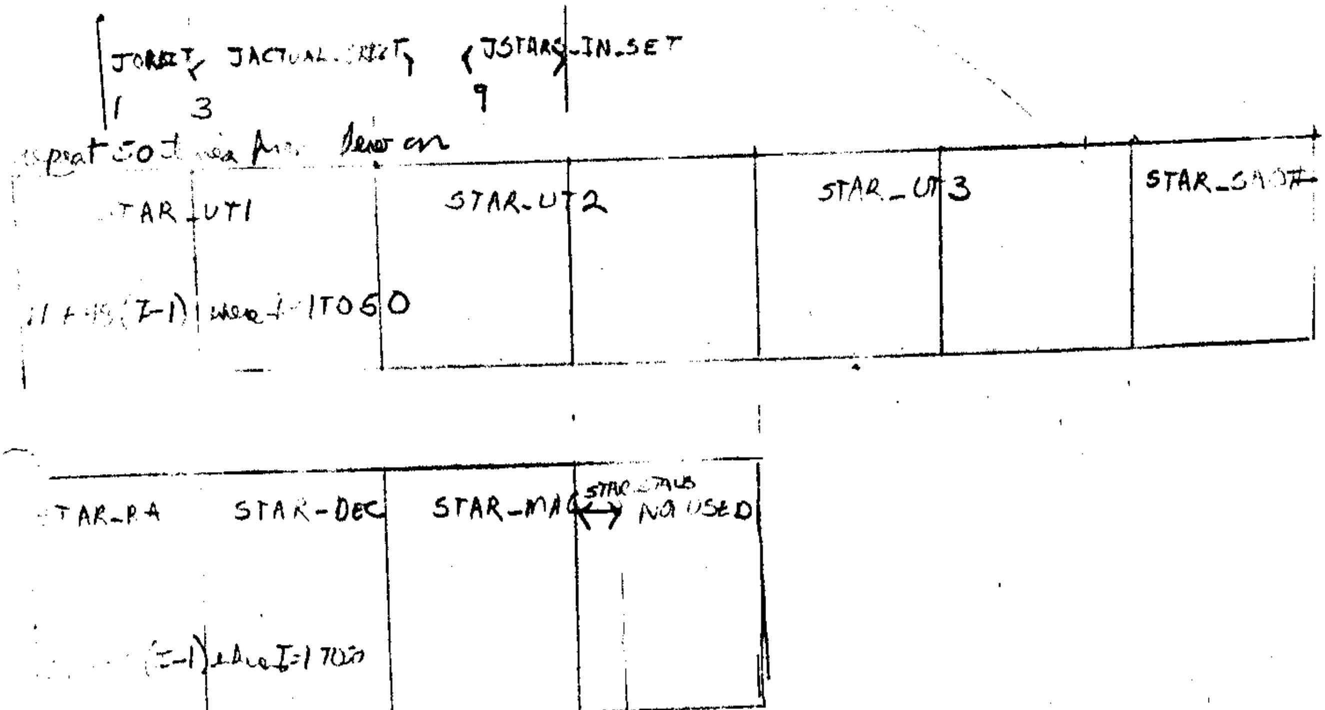
DD cards for reading

```
        DD DSN=SASA.P230.FINPOINT.R&R,DCB=BUFNO=1,DISP=SHR,
//         VOL=REF=SASA.R&R
```

where &R is the orbit number; &SUF is the suffix; &BUF is the number of buffers,; &DUM is set equal to 'DUMMY,' is no out put is desired.

File Definition

```
DECLARE FOMFINE FILE RECORD OUTPUT SEQUENTIAL;



DECLARE 01 FINREC  ALIGNED EXTERNAL,
           02 JORBIT,
           02 JACTUAL_ORBIT   CHAR(5),
           02 JSTARS_IN_SET,
           02 FINE_ASPECT(50),
              03 STAR_UT1 FLOAT BINARY(53),
              03 STAR_UT2 FLOAT BINARY(53),
              03 STAR_UT3 FLOAT BINARY(53),
              03 STAR_SAO#  FIXED BINARY(31),
              03 STAR_RA,
              03 STAR_DEC,
              03 STAR_MAG,
              03 STAR_STATUS  BIT(8);
```



UHURU DATA SET DESCRIPTION

NAME: SASA. P230. RGHPOINT. R&R
where the five digit (starting) orbit number must replace &R
SOURCE & PURPOSE:

The star identification program, P230, identified sets of star sightings for input to the equation of motion. This rough solution is saved for input to P260. SASA P230 RGHPOINT. R&R and SASA. P230. FINPOINT. R&R contain the sighting times of the accepted star pulses and star identification for input to P260.

FORMAT:

There is one record for each set. The format of the data is as follows:

ISTARS_PER_SET	no. of identified stars in set
IACTUAL_ORBIT	five digit orbit number
ISETH	number of set within orbit
H(3)	spin rate, right ascension, declination of spin axis
B(3)	error in spin rate, right ascension, declination of spin axis
UT1START	time in days and fraction of a day since January 0, 1970 of first star sighting for the set
UT3START	time in days and fraction of a day since January 0, 1970 of last star sighting for the set

DD cards for writing (MOD file)

```
// [illegible] &DUM.DSN=SASA.P230.RGHPOINT.R&R&SUF,VOL=REF=SASA.R&R&SUF,      [illegible]
//  [illegible](BLKSIZE=0050,LRECL=0050,RECFM=F),SPACE=(TRK,(2,1)),DISP=(,KEEP) 00000100
// [illegible]   DD &DUM.DSN=SASA.P230.RGHPOINT.R&R&SUF,VOL=REF=SASA.R&R&SUF, [illegible]
//  [illegible]BLKSIZE=0050,LRECL=0050,RECFM=F,BUFNC=&BUF),DISP=MOD           [illegible]
```

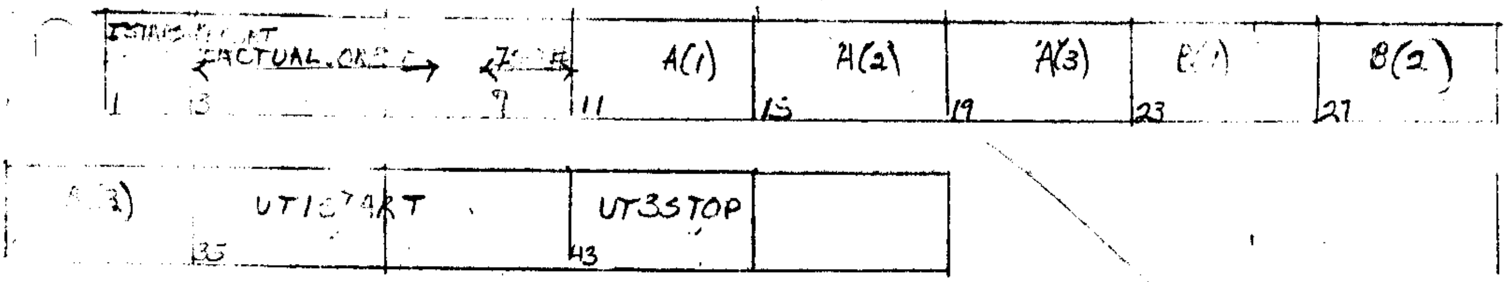
DD cards for reading

```
//[illegible]  DSN=SASA.P230.RGHPOINT.R&R,DCB=BUFNC=1,DISP=SHR,                 00000180
//    VOL=[illegible]=SASA.R&R                                                  00000190
```

where &R is the orbit number, &SUF is the suffix, &BUF is the number of buffers, and &DUM is set equal to 'DUMMY,'. if no output is desired.

Record Format

```
[illegible]LARE EQMRGH  FILE RECORD OUTPUT SEQUENTIAL;                        PREQ0110

DECLARE 01 RGHREC  ALIGNED EXTERNAL,                                          PREQ0360
         02 ISTARS_PER_SET,                                         /*70.364*/PREQ0370
         02 IACTUAL_ORBIT   CHAR(5),                                          PREQ0380
         02 ISET#,                                                  /*70.364*/PREQ0390
         02 ROUGH_ASPECT_SET,                                                 PREQ0400
            03 A(3),        /* OMEGA,     ALPHAS,     DELTAS     */           PREQ0410
            03 B(3),        /* OMEGADEV, ALPHASDEV, DELTASDEV */              PREQ0420
            03 UT1START   FLOAT BINARY(53),                                   PREQ0430
            03 UT3STOP    FLOAT BINARY(53);                                   PREQ0440
```



UHURU DATA SET DESCRIPTION

NAME: SASA.P260.EQMCNSTS.R&R

where the five digit (starting) orbit must replace &R

SOURCE & PURPOSE:

The equation of motion program defines a superposition interval in which the spin axis does not drift more than 3^{o} on the sky so that the data from successive spins may be summed. This file contains the constants of the equation of motion for each orbit. This file may be accessed through COORDS rather than directly. This file is used by P300,P500,P600.

FORMAT:

This data set contains one record for each superposition period. The format of each record is as follows:

UT_FIRST	start time of the superposition period in days and fraction of a day since January 0, 1970
UT_LAST	stop time of the superposition period in days and fraction of a day since January 0, 1970
NORBITS	number of orbits in the superposition period
NBAO	number of bad orbits in the superposition period
DUMMY	set equal to zero
ALPAVX	average right ascension of the superposition period
DELAVX	average declination of the superposition period
OMEAVX	average spin rate of the superposition period
AX(3,3)	the rough fit spin rate is given by omega =AX(1,1) + AX(1,2)*t+AX(1,3)*t^2 the rough fit right ascension is given by alpha=AX(2,1)+AX(2,2)*t+AX(2,3)*t^2 the rough fit declination is given by delta=AX(3,1)+AX(3,2)*t+AX(3,3)*t^2
ORBITCNST	for each orbit up to thirty the following information is given
UT_MID	the center time of the superposition interval for the orbit in days and fractions of a day since January 0, 1970
UT_ORBX	records from the middle of the orbit (UT_MID) to the beginning of the orbit in fractions of a day
UT_ORBY	records from the end of the orbit to the middle of the orbit (UT_MID) in fractions of a day
UT_GAPX	seconds from the middle of the orbit (UT_MID) to the beginning of the gap in fractions of a day
UT_GAPY	seconds from the end of the gap to the middle of the orbit (UT_MID) in fractions of a day
AY(11)	constants for the azimuth
AZ(11)	constants for the elevation
TOX	
POX	
ORBIT_NO	five character orbit number for the orbit

ORBIT_DEF

Bit 1	No θ fit for orbit
Bit 2	No φ fit for orbit
Bit 3	Poor θ fit for orbit i.e. RMS error exceeds THE_DEV
Bit 4	" φ " " " " " " " PHI_DEV
Bit 5	Limited number of groups of stars, no rough fit
Bit 6	
Bit 7	No discontinuity in θ or φ is imposed across GAP
Bit 8	Orbit includes data gap due to tape recorder playback hereby called GAP
Bit 9	Limited number of stars in θ fit after Gap
Bit 10	" " " " " θ " before Gap
Bit 11	" " " " " φ " after Gap
Bit 12	" " " " " φ " before Gap
Bit 13	Range of θ fit was shortened because of segments of time with low star density
Bit 14	Range of φ fit was shortened because of segments of time with low star density
Bit 15	Small and groups of stars were rejected hence shortening range of and fits
Bit 16	Extrapolate fit through daytime

ORBIT_SAT

Bit 01

Bit 02

Bit 03

Bit 04

Bit 05

Bit 06

Bit 07

Bit 08

Note: When a scheme for extrapolating fit through daytime data is completed and programmed into the Equation of Motion, bits in ORBIT_SAT will be set and a a descr iption of them reported.

File Definition

```
DECLARE SUPFIT FILE OUTPUT RECORD SEQUENTIAL ;


DECLARE 01 SUPCNST ALIGNED,
          02 (UT_FIRST,UT_LAST) FLOAT BINARY(53),
          02 NORBITS,
          02 NBAD,
          02 DUMMY,
          02 (ALPAVX,DELAVX,OMEAVX),
          02 AX(3,3),
          02 ORBITCNST(30),
            03 UT_MID FLOAT BINARY(53),
            03 UT_ORBX,
            03 UT_ORBY,
            03 UT_GAPX,
            03 UT_GAPY,
            03 AY(11),
            03 AZ(11),
            03 TOX,
            03 POX,
            03 ORBIT_NO CHAR(5),
            03 ORBIT_DET BIT(16),
            03 ORBIT_STAT BIT(8) ;
```

DD for creating file (mod data set must be preallocated)

```
//SUPFIT DD &DUM.DSN=SASA.P260.EQMCNSTS.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(RECFM=F,LRECL=3912,BLKSIZE=3912,BUFNO=1),SPACE=(TRK,(7,1)),
//   DISP=(NEW,KEEP)

//SUPFIT DD &DUM.DSN=SASA.P260.EQMCNSTS.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//  DCB=(RECFM=F,LRECL=3912,BLKSIZE=3912,BUFNO=1),DISP=MOD
```

DD for reading

```
//SUPFIT   DD DSN=SASA.P260.EQMCNSTS.R&R,VOL=REF=SASA.R&R,DISP=SHR,
//  DCB=BUFNO=1
```

		UT_LAST		NORM READ	DUMMY	[illegible]	[illegible]
[illegible]	[illegible](1,1)	AX(1,2)	AX(1,3)	AX(2,1)	AX(2,2)	AX(2,3)	[illegible]
AX(3,[illegible])	AX([illegible])						

repeat [illegible] on

UT [illegible]		UT_ORBX	UT_OREY	UT_[illegible]	UT_GAPY	[illegible])	[illegible]
[illegible]+128(I-1) [illegible] I=1 TO 30 [illegible]							
AY([illegible])	AY([illegible])	([illegible])	AY([illegible])	AY(7)	AY(8)	AY([illegible])	[illegible]Y(10)
105 + 128(I-1) [illegible] I=1 TO 30							
AY[illegible]	AZ(1)	AZ([illegible])	AZ(3)	[illegible]	AZ(5)	AZ(6)	[illegible])
137+128(I-1) [illegible] I=1 TO 30							
[illegible])	AZ(9)	AZ(10)	AZ(11)	TOX	POX	ORBIT_NO	~~[illegible]~~
169+128(I-1) [illegible] I=1 TO 30							

UHURU DATA SET DESCRIPTION

NAME: SASA.P260.SUPINTVS

(where the five digit ((starting)) orbit number must replace &R)

SOURCE & PURPOSE:

The equation of motion program defines a superposition interval in which the spin axis does not drift more than 3^{o} on the sky so that the data from successive spins may be summed. This file gives the start and stop times of the superposition period and the average right ascension, declination and spin rate of the spin axis. If there is only one record then this file is partly copied onto another file in P300 so that the constants may be used in the other programs. If there is more than one superposition interval, then all the programs are run over from P300 with the second record on this file.

FORMAT: This data sets contain one record for each superposition period. The format of each record is as follows:

UTSUP_START	start time of superposition interval in days and fraction of a day since January 0, 1970
UTSUP_STOP	stop time of superposition interval in days and fraction of a day since January 0, 1970
ALPHA	average right ascension of the spin axis
DELTA	average declination of the spin axis
OMEGA	average spin rate of the spin axis
ISUP#	number of the superposition period, usually one unless there is a second period
SUPINTV_STATUS	all bits set to zero
NO_OF_BAD_ORBITS	number of bad orbits in superposition period
NO_OF_ORBITS	number of orbits in superposition period
ORBIT_INFO	for each orbit up to thirty, the following information is given
ORBIT_ID	five character orbit number for the orbit
ORBIT_STATUS	bit 1 on data includes daytime data (as of now all data is night time data)

File Definition

```
   DECLARE SUPDEF FILE OUTPUT RECORD SEQUENTIAL ;
DECLARE 01 SUPDATA ALIGNED,
           02 (UTSUP_START, UTSUP_STOP) FLOAT BINARY(53),
           02 (ALPHA,DELTA,OMEGA),
           02 ISUP#,
           02 SUPINTV_STATUS BIT(8),
           02 NO_OF_BAD_ORBITS,
           02 NO_OF_ORBITS,

           02 ORBIT_INFO(30),
              03 ORBIT_ID  CHAR(5),
              03 ORBIT_STATUS  BIT(8);
```

DD card for writing (MOD) file

```
/ [illegible] DD &DUM.DSN=SASA.P260.SUPINTVS.R&R&SUF,VOL=REF=SASA.R&R&SUF,
/   DCB=(RECFM=F,LRECL=0216,BLKSIZE=0216,BUFNO=1),SPACE=(TRK,(1,1)),
/   DISP=(NEW,KEEP)

//  PREF DD &DUM.DSN=SASA.P260.SUPINTVS.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(RECFM=F,LRECL=0216,BLKSIZE=0216),BUFNO=1),DISP=MOD
```

DD card for reading

```
   //SUPDEF    DD DSN=SASA.P260.SUPINTVS.R&R,VOL=REF=SASA.R&R,DISP=SHR,
   //     DCB=BUFNO=1
```

where &R is the orbit number, &SUF is the suffix, and &DUM is set equal to 'DUMMY,' if no output is desired.

UTSUP_START UTSUP_STOP ALPHA DELTA

1 2 3 7 13 17 21 25

NO. OF BACKGROUND

33 37 42 43 48 49 54 55 60 61

1 2 3 4

78 79 84 85 96

7

102 103 108 109 114 115 120 121

11 12 13

138 139 144 145 150 151

17 18 19

162 163 174 175 181 187 192

21 22 23

198 199 204 205 210 211

27 28 29

UHURU DATA SET DESCRIPTION

NAME: SASA.P300.CURNTSUP.R&R

(where the five digit ((starting)) orbit number must replace &R)

SOURCE & PURPOSE: This file is almost identical to the one from which it is copied SASA.P260.SUPINTVS.R&R. This file contains the start and stop times of the superposition as well as the average right ascension,declination and spin rate. This file defines the superposition interval and there is only one record in this file.

FORMAT: There is only one record in this file. It contains the following information:

UTSUP_START	start time of the superposition interval in days and fractions of a day since Jan 0, 1970
UTSUP_STOP	stop time of the superposition interval in days and fractions of a day since Jan 0, 1970
ALPHA	average right ascension of the spin axis
DELTA	average declination of the spin axis
OMEGA	average spin rate of the spin axis
ISUP#	number of the superposition interval within this processing group
SUPINTV_STATUS	Bit 1 on indicates superposition processed Bit 8 on indicates data cross switched
NO_OF_BAD_ORBITS	No. of bad orbits in superposition period
NO_OF_ORBITS	No. of orbits in superposition periods
ORBIT_INFO	for first 15 orbits(not usable)
ORBIT_ ID	five character number for the orbit
ORBIT_STATUS	bit 1 on data includes daytime data (as of now all data is night-time data)

File Definition

```
DECLARE SUPDEFX FILE OUTPUT RECORD SEQUENTIAL;
```

```
DECLARE 01 SUPER_DEF ALIGNED,
      02 (UTSUP_START, UTSUP_STOP) FLOAT BINARY(53),
      02 (ALPHA, DELTA, OMEGA),
      02 ISUP#,
      02 SUPINTV_STATUS BIT(8),
      02 NO_OF_BAD_ORBITS,
      02 NO_OF_ORBITS,
      02 ORBIT_INFO(15),
         03 ORBIT_ID  CHAR(5),
         03 SUPORBIT_STATUS  BIT(8);
```

DD for writing

```
//SUPDEFX   DD &CUM.DSN=SASA.P300.CURNTSUP.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(BLKSIZE=0126,LRECL=0126,RECFM=F,BUFNO=1),
//   SPACE=(TRK,(01,1),RLSE),DISP=(NEW,KEEP)
```

DD for reading

```
//SUPDEFX   DD   DSN=SASA.P300.CURNTSUP.R&R&SUF,DISP=SHR,DCB=BUFNO=&BUF,
//     VOL=REF=SASA.R&R&SUF
```

UTSUP_STOP ALPHA DELTA
9 17 21 25 29

ORBIT_ID(2)
ORBIT_STATUS(1)
42 43 48 49 54 55 60

72 73 78 79 84 85 90 91

ORBIT_ID(9)
102 103 108 109 114 115 120 121 126

NAME: SASA. P300. XSPINPKS.R&R

where the five digit (starting) orbit number must replace &R

SOURCE & PURPOSE: As P300 (the superposition program) collects the data from each spin for superposition, the single spin data are scanned for possible peaks which are listed in SASA. P300. XSPINPKS. R&R for further processing by P600

FORMAT: This data set contains one record for each peak found. Each data set contains the following information.

UTSPINSTOP	is the end time of the spin period in which the peak occurred in day and fraction of a day since January 0, 1970
SIG3THETA	the azimuth of the peak in degrees
SIG3_INTENSITY	intensity in cts/sec of the peak
SIG3_WIDTH	width of the peak in bins 108 bins per 360^{o} for side 2, 1080 for side 1
SIG3_STATUS	'1' B side 2 ' 0'Bside 1
FILLER	filler characters

File Definition

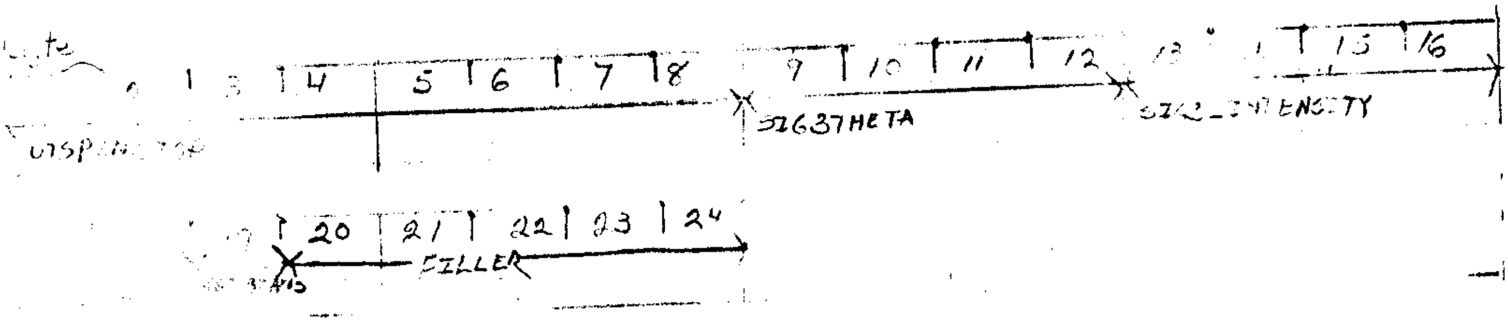
```
DECLARE SPINPKS FILE OUTPUT RECORD SEQUENTIAL         ;        SIGM0360
DECLARE 01 SIG3PKS       ALIGNED          ,                     SIGM0370
         02 UTSPINSTOP      FLOAT BINARY(53)          ,         SIGM0380
         02 SIG3THETA            ,                              SIGM0390
         02 SIG3_INTENSITY,                                     SIGM0400
         02 SIG3_WIDTH      FIXED BINARY(15)  ,                 SIGM0410
         02 SIG3_STATUS     BIT(8)          ,                   SIGM0420
         02 FILLER       CHAR(5) ;                              SIGM0430
```

A DD statement for creating this data set (a MOD data must be pre-allocated)

```
//DUI     DD  &DUM.DSN=SASA.P300.XSPINPKS.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(BLKSIZE=009 ,LRECL=0024,RECFM=FB,BUFNO=1),SPACE=(TRK,(03,1)),
//   DISP=(NEW,KEEP),
//SPINPKS  DD &DUM.DSN=SASA.P300.XSPINPKS.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//   DCB=(BLKSIZE=0096,LRECL=0024,RECFM=FB,BUFNO=1),DISP=MOD
```

A DD statement for writing this data set

```
//SPINPKS DD DSN=SASA.P300.XSPINPKS.R&R&SUF,VOL=REF=SASA.R&R,DISP=SHR
```



4
5
6
7
8
9
10
11
12
15
16
20
21
22
23
24
FILLER

UHURU DATA SET DESCRIPTION

NAME: SASA. P300. XSUPDATA. R&R

(where the five character ((starting)) orbit number for the batch must replace &R)

Format:

This data set contains 4320 records for side 1, followed by 1080 records for side 2.

Each data set contains the following information:

XCOUNTS	number of counts
XTIME	number of times data is sampled every 0.96 second for side one, (every .384 seconds for side two)
XBINTH	number of the bin (1 to 4320 for side one, -1 to -1080 for for side two)

File Definition

```
DECLARE SUPXFIL FILE OUTPUT RECORD SEQUENTIAL;                PROS0330
                                                              PROS036
DECLARE 01 SUPXREC ALIGNED,                                   PROS0370
         02 XCOUNTS FIXED BINARY(31),                         PROS0380
         02 XTIME FIXED BINARY(15),                           PROS0390
         02 XBIN# FIXED BINARY(15);
```

DD for writing

```
//SUPXFIL  DD &[illegible].DSN=SASA.P300.XSUPDATA.R&R&SUF,VOL=REF=SASA.R&R&SUF,
//  DCB=(BLKSIZE=[illegible]00,LRECL=0008,RECFM=FB,BUFNO=1),
//  SPACE=(TRK,([illegible],1),RLSE),DISP=(NEW,KEEP)
```

DD for reading

```
//SUPXFIL  DD DSN=SASA.P300.XSUPDATA.R&R&SUF,VOL=REF=SASA.R&R&SUF,
// DISP=SHR,DCB=BUFNO=&BUF
```

```
**************************************************
     STANDARD LABEL DUPE OF N00597 ONTO Z350
**************************************************
```

D-10101

THE FOLLOWING FILES WERE COPIED :

DSNAME	VOL-SEQ	DSSEQ	RECFM	LRECL	BLKSIZ	BLKCNT
A.LOADCARD.R00597	0001	0001	FB	00080	00800	5
SA.DDCARDS.R00597	0001	0002	FB	00080	00800	7
0.MINFRAME.R00597	0001	0003	F	03360	03360	1600
0.ORBITINX.R00597	0001	0004	FB	00045	00450	1
0.SUBFRAME.R00597	0001	0005	F	00472	00472	1200
0.SUBGPSX1.R00597	0001	0006	FB	00018	00180	1
0.SUBGPSX2.R00597	0001	0007	FB	00018	00180	1
0.EPHEMRIS.R00597	0001	0008	FB	00032	00320	86
0.FINPOINT.R00597	0001	0009	F	02403	02403	22
0.RGHPOINT.R00597	0001	0010	F	00050	00050	22
0.EQMCNSTS.R00597	0001	0011	F	03912	03912	1
0.SUPINTVS.R00597	0001	0012	F	00216	00216	1
0.CURNTSUP.R00597	0001	0013	F	00126	00126	1
0.XSPINPKS.R00597	0001	0014	FB	00024	00096	15
0.XSUPDATA.R00597	0001	0015	FB	00008	00800	54
0.X1GPSCMB.R00597	0001	0016	FB	00016	00160	2
0.X1GPSIND.R00597	0001	0017	FB	00018	00180	2
0.X2GPSCMB.R00597	0001	0018	FB	00016	00160	1
0.X2GPSIND.R00597	0001	0019	FB	00018	00180	2
0.CURNTLIN.R00597	0001	0020	F	01088	01088	19
0.XXSKYSUM.R00597	0001	0021	FB	00012	01296	51
0.FLAREPKS.R00597	0001	0022	FB	00024	00240	2
0.THREESIG.R00597	0001	0023	FB	00082	00656	3

END OF VOLUME. DUPE COMPLETED.

598

F0F0F5F9F843181F745CBBC2B9431820909AA4041700547F00000000100001E8000001E260000000079007A0000F0F0F5F9F9
431820C3E759E713431821B633ECD637000547F000001E8100003880000019C9007A00E100680000F0F0F6F0F1431821BF8F
508258431822D27B241403000547F000003881000056000001D5800E2015700760000F0F0F6F0F2431822DBD687C0234318
23F368641BF9000547F000005601000074000000C01DBD015801CF00780000F0F0F6F0F3431823FF1B4DBADD4318251 6B02A16
B3000547F000007401000092000001DF401D0024700780000

603

REC 1. LENGTH 225

D-10101

1/21/71 - 1/22/71

ORBITS 598-603

REQ. AGENT	ACQ.AGENT
CMW	WHW

SAS-A

4th UHURA SELECTED X-RAY DATA

70-107A-01G

This data set catalog contains 1 magnetic tape. One SAS-A tape. This tape is 6250 BPI, ASCII, 9 track, contains 1 file, and created on the IBM computer. The following list the D#'s, C#'s, and NSSDC ID#'s of the tape.

D#	C#	TIME SPAN	NSSDC ID#
D-85882	C-29055	NOT AVAILABLE	70-107A-01G

SECTION 1 - INTRODUCTION

In recent years there has been a trend away from publishing catalogues in book form to preparing catalogues by computer and distributing them on magnetic tape, with appearance in book form a secondary occurrence. This memo is the result of the development of the documentation for the machine-readable version of the catalogue and includes the basic information given in the original preface of the published catalogue. This memo should be distributed along with any copy of the machine-readable version of the catalogue.

SECTION 2 - TAPE CONTENTS

A byte-by-byte description of the contents of the catalogue is given in Table 2-1. The information in the "Description" column is derived mainly from the published version of the catalogue whenever possible. The "Suggested Format" column is for FORTRAN-formatted reads.

Table 2-1. Tape Contents

4TH UHURU CATALOGUE

Bytes	Description	Suggested Format
1-12	Name of celestial source	12A1
13-22	Right Ascension (1950.0) (unit = degrees)	F10.4
23-32	Declination (1950.0) (unit = degrees)	F10.4
33-40	X-ray intensity (where applicable in units of given detector)	8A1
41-80	Comments	40A1

SECTION 3 - REMARKS AND MODIFICATIONS

The 4th UHURU Catalogue (W. Forman, C. Jones, L. Cominsky, P. Julien, S. Murray, G. Peters, H. Tananbaum, and R. Giacconi, 1977, Center for Astrophysics Preprint #763 - submitted to the Astrophysical Journal Supplement) has been made machine-readable by Dr. G. Share (Naval Research Laboratory). The information given in this document has been obtained via private communication with Dr. Share. No effort has been expended to verify the contents and Dr. Share bears the responsibility for any key punching errors.

4th UHURU Catalogue

First 58 records of file.

Logical record length is 80 bytes.
Each record is printed in one line of 80 characters.

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          111111111122222222223333333333444444444455555555556666666666777777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
4U0000+72        0.0000   72.6100   1.65
4U0005+20        1.4500   20.0500   2.52 SEYFERT-MKN 335
4U0009-33        2.3000  -33.9000   2.15 3U0001-31 NGC10 CLUSTER CA0007-306
4U0010+39        2.7000   39.6000   2.93 FLARE STAR BD+43 44
4U0015+02        3.8300    2.8600   2.45
4U0022+63        5.6000   63.8800   8.89 3U0022+63  SNR TYCHO=3C10 CEPHXR-1
4U0026-73        6.6000  -73.0200   2.76
4U0026-29        6.7200  -29.1500   3.12
4U0027+59        6.9500   59.7000   3.30                      A0026+59
4U0028+22        7.2200   22.0800   3.30           3U0032+24
4U0033+58        8.3000   58.8500   4.33       3C14.1
4U0037+39        9.2700   39.8750   2.40 M31       3U0021+42  2A0039+411
4U0037-10        9.3500  -10.1250   2.90 ABELL 85  3U0026-09 2A0039-096
4U0041+36       10.4800   36.8300   3.15
4U0041+32       10.5000   32.7750   30   5         3U0042+32 2A0042+323
4U0050-01       12.6300   -1.9900   3.39 ABELL119 PHL 923        2A0054-015
4U0051-68       13.0000  -68.7500   2.82
4U0054+60       13.5750   60.9250   4.24  STAR CAS              MX0053+60
4U0103-21       15.9750  -21.8750   2.74 ABELL 133 3U0057-23  2A0102-222
4U0106-59       16.5200  -59.7700   3.04                       2A0120-591
4U0115+63       18.8070   63.4770   70   TRANSIENT  3U0115+63
4U0115-73       18.8300  -73.6950   36   STAR SANDULEAK 160 SMC X-1 3U0115-73
4U0115-36       18.9500  -36.5500   1.91                       2A0120-353
4U0129-09       22.4000   -9.9900   1.95
4U0134-11       23.6400  -11.5400   2.70  SUPERCLUSTER
4U0138+48       24.6250   48.0500   3.55
4U0142+61       25.6900   61.2300   4.99           3U0143+61
4U0148+36       27.1600   36.0400   2.44 ABELL 262 3U0151+36
4U0223+31       35.9500   31.2750   3.11  SEYFERT MKN81
4U0228-13       37.1300  -13.0600   5.27  ABELL 358
4U0241+61       40.3100   61.8800   3.25           3U0258+60
4U0248-85       42.1000  -85.3500   2.11
4U0253+41       43.2700   41.7100   4.89           3U0227+43 MX0255+41 2A0251+413
4U0254+13       43.6500   13.2500   3.4  ABELL 401 3U0254+13 2A0255+132
4U0302-22       45.7300  -22.3000   2.71
4U0310+46       47.5500   46.5500   3.71
4U0311+53       47.9600   53.0500   2.88           3U0318+55
4U0316+41       49.1450   41.3530   47.4 ABELL 426 3U0316+41   PER X-1  2A0316-443
4U0320-45       50.2500  -45.0250   2.16 CLUSTER   3U0302-47 SC0316-458
4U0322+59       50.6500   59.5500   2.93
4U0334-30       53.5500  -30.2000   2.88
4U0336+01       54.0500    1.0200   100   10 TRANSIENT
4U0339-54       54.8500  -54.5000   1.90 CLUSTER   3U0328-52 CA0340-53, 2A0343-54
4U0344+11       56.2440   11.1500   1.80                     2A0335+096
4U0352+30       58.0900   30.9100   30   STAR X PERSEI 3U0352+30  2A0352+309
4U0357-74       59.4000  -74.3250   1.76
4U0403+47       61.0000   47.6750   3.67 STAR 48 PER
4U0406-30       61.6000  -30.8750   1.72
4U0407+37       61.8500   37.9250   2.62
4U0410+10       62.7200   10.5500   3.06 ABELL 478 3U0405+10 2A0411+103
4U0421+34       65.3750   34.7250   3.74           3U0430+37
4U0423-53       65.8500  -53.1500   3.30 NGC 1566  3U0400-59  CLUSTER SC0417-558
4U0427-07       66.9000   -7.7000   3.46 ABELL 494
4U0427-61       66.9400  -61.5500   2.31 CLUSTER   3U0426-63 SC0430-616 2A0430-61
4U0429-31       67.3400  -31.0000   3.82
4U0431-12       67.8500  -12.9500   2.54 ABELL 496
4U0432+05       68.1000    5.6000   2.76 SEYFERT   3U0440+06    3C120
4U0443-09       70.8000   -9.5000   1.77           3U0431-10 SUPERCLUSTER
```

4th UHURU Catalogue

Last 58 records of file.

Logical record length is 80 bytes.
Each record is printed in one line of 80 characters.

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         11111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890
4U1852+37     283.1600   37.0000   1.77
4U1853-23     283.4000  -23.9500   3.22
4U1857+01     284.3500    1.1900   4.05  BURSTER A1905+00 MXB1906+00
4U1859+69     284.8500   69.8500   2.09 ABELL2312 3U1843+67 ABELL2315 2A1854+683
4U1901+03     285.4250    3.1000   87   10        3U1901+03 TRANSIENT
4U1907+09     286.8250    9.7250   20   5         3U1906+09
4U1908+00     287.0300     .5200   200  20 AQLXR1 3U1908+00 RECURRENT TRANSIENT
4U1908+05     287.0500    5.1250   3.66  A1909+04
4U1909+07     287.3000    7.6250   4.61           3U1912+07
4U1915-05     288.8250   -5.2000   20   2         3U1915-05
4U1915-79     289.0000  -79.3000   2.50           3U1849-77
4U1918+15     289.7000   15.0000   50   10   TRANSIENT  A1918+14
4U1919+44     289.8550   44.0700   3.90 ABELL2319 3U1921+43       2A1919+438
4U1920+34     290.0500   34.0500   3.50
4U1924-59     291.1460  -59.4390   1.93   2A1914-589
4U1933+36     293.4000   36.1500   2.26
4U1943+36     295.8500   36.4000   3.02
4U1954+31     298.5070   31.9570   63   5         3U1953+31
4U1955-68     298.9000  -68.9000   3.07 CLUSTER   3U1959-69 CA1955-692 PKS1955-
4U1956+35     299.0920   35.0600   1175 5  CYGX-1 3U1956+35 HDE226868
4U1957+11     299.3200   11.5750   17.4           3U1956+11
4U1957+40     299.3200   40.5400   4.03 CYG A     3U1957+40 CLUSTER 3C405
4U2001+62     300.3500   62.6000   2.56           3U1956+65
4U2003+64     300.9000   64.3700   2.64
4U2018+39     304.7500   39.5000   3.45
4U2028+42     307.2000   42.8200   3.84
4U2030+40     307.6390   40.7850   385  2  CYG X3 3U2030+40 PERIODSO 4.8 HR;16.8
4U2046+31     311.6900   31.9000   1.69      SNR CYGNUS LOOP
4U2048+44     312.1500   44.3750   3.57
4U2055+49     314.0000   49.3250   3.39           3U2052+47
4U2058+32     314.5500   32.8750   2.88
4U2103+31     316.0000   31.5000   2.08
4U2120+32     320.0900   32.1300   3.05
4U2126-60     321.6150  -60.3250   1.81   2A2155-609  MX2140-60
4U2129+47     322.4000   47.1050   20   2         3U2129+47
4U2129+12     322.4400   12.1000   4.42 NGC7078   3U2131+11 GLOB CLUS M15
4U2134+55     323.6500   55.7500   2.63
4U2135+57     323.9250   57.1500   2.83  CEP X-4
4U2142+38     325.6480   38.0870   550  2  CYG X2 3U2142+38 PERIODO 11.17 DAY
4U2206+54     331.5750   54.4000   2.93           3U2208+54  A2204+54
4U2209+26     332.3000   26.1000   2.47
4U2213+23     333.4750   23.9000   2.19
4U2224-78     336.2000  -78.2500   3.90
4U2238+60     339.7250   60.7250   2.81           3U2233+59
4U2240+26     340.1000   26.7000   2.95
4U2252+18     343.1400   18.1500   2.49
4U2259+16     344.7800   16.1000   2.95  SUPERCLUSTER
4U2300+08     345.1780    8.7760   2.69 SEYFERT NGC 7469  2A2259+085
4U2305-07     346.2930   -7.3150   2.31  2A2302-088
4U2315+15     348.8600   15.3200   4.41    ABELL 2589  2A2322+166
4U2316+61     349.1500   61.8000   2.40
4U2321+58     350.3030   58.5580   53.4           3U2321+58 SNR CAS A 3C461
4U2335+42     353.9750   42.7250   1.97
4U2344+08     356.0200    8.6500   3.03   ABELL 2657
4U2344-27     356.0250  -27.0000   1.80  CLUSTER KLEMOLA 44  2A2344-285
4U2345+27     356.3500   27.3000   2.44 ABELL2666 3U2346+26
4U2351+06     357.8200    6.7700   3.69 SEYFERT MKN 541  ABELL 2665
4U2358+21     359.6750   21.0750   1.92
```

D-P8P3

TO-107A-01G

```
$NOP
$NOP
$NOP
$NOF ***************** LIST OF CMW 12 ********************
$EXE TPLIST BS

INPUT PARAMETERS ARE:   AS AL 1 1 1

 TAPE NO.   1              FILE NO.   1
 RECORD   1                LENGTH   2712
4U0000+72        .           72.61        1.65                                                    4U0005+28          1.4
300   20.0500   2.52 SEYFERT-MKN 335                                  4U0009-33          2.3000  -33.9000    2.1
5 3U0001-31 NGC1  CLUSTER CA0007-306         4U0010+39          2.7000   39.6000    2.93 FLARE STAR BD+43
14                     4U0015+02          3.8300    2.8600    2.45
    4U0022+63                5.6 00   63.880      8.89 3U0022+63  SNR TYCHO=3C10 CEPHXR-1        4U0026-73
 6.6000  -73.0200     2.76                                                    4U0026-29          6.7200  -29.1500
 3.12                                                      4U0027+59          6.9500   59.7000    3.30
      A0026+59              4U0028+22          7.2200    22.0800     3.30             3U0032+24
       4U0033+58          8.3000    58.850       4.33            3C14.1                                   4U0037+39
      9.2700   39.8750     2.40 M31        3U0021+42   2A0039+411           4U0037-10          9.3500  -10.12
50    2.90 ABELL 85   3U0026-09 2A0039-096            4U0041+36           10.4800   36.8300    3.15
                                4U0041+32          10.5000   32.7750    30    5          3U0042+32 2A0042+3
23            4U0050-01          12.6300   -1.9900    3.39 ABELL119 PHL 923          2A0054-015        4U0051-
58         13.0000  -68.7500     2.82                                                  4U0054+60          13.5750   6
0.525.    4.24   STAR CAS                  MX0053+6             4U0103-21          15.9750  -21.8750    2.74 ABELL
 133 3U0057-23  2A0102-222              4U0106-59          16.5200  -59.7700     3.04                          2A01
20-591             4U0115+63           18.8370    63.4770     70   TRANSIENT  3U0115+63                     4U0
115-73           18.830   -73.6950    36    STAR SANDULEAK 160 SMC X-1 3U0115-73     4U0115-36          18.9500
  -36.5500      1.91                        2A0120-353               4U0129-05          22.4000   -9.9500   1.95
                                          4U0134-11          23.6400  -11.5400    2.70  SUPERCLUSTER
                        4U0138+48           24.6250    48.0500    3.55
  4U0142+61           25.6900   61.2300     4.99                  3U0143+61                          4U0148+36         27.
160    36.1400     2.44 ABELL 262  3U0151+36                        4U0223+31           35.9500   31.2750    3.
11  SEYFERT MKN81                                      4U0228-13          37.1300  -13.0600    5.27  ABELL  358
                           4U0241+61          40.3100   61.8800    3.25                  3U0258+60
     4U0248-85           42.1000  -85.3500      2.11                                                       4U0253+41
 43.2700    41.7100     4.89                 3U0227+43 MX0255+41 2A0251+4134U0254+13           43.6500   13.2500
  3.4   ABELL 401 3U0254+13 2A0255+132                4U0302-22           45.7300  -22.3000     2.71
                              4U0310+46          47.5500    46.5500     3.71
          4U0311+53          47.9600   53.0500     2.88                  3U0318+55                           4U0316+41
     49.1450    41.3530    47.4 ABELL 426 3U0316+41   PER X-1  2A0316-4434U0320-45          50.2500   -45.0
250    2.16 CLUSTER      3U0302-47 SC0316-458                4U0322+59          50.6500    59.5500     2.93
                                      4U0334-30          53.5500  -30.2000     2.88
                    4U0336+01           54.0500     1.0200    100   10 TRANSIENT                               4U0339
-54          54.8500  -54.5000     1.90 CLUSTER     3U0328-52 CA0340-53, 2A0343-544U0344+11           56.2440
11.1500     1.80                       2A0335+096              4U0352+30          58.0900    30.9100    30    STAR
 X PERSEI 3U0352+30   2A0352+309      4U0357-74          59.4000  -74.3250    1.76
                       4U0403+47           61.       47.6750     3.67  STAR 48  PER                               4U
0406-30          61.6000  -30.8750     1.72                                                 4U0407+37          61.850
0  37.9250     2.62                                                 4U0410+10           62.7200    10.5500    3.06
AEELL 478 3U0405+1  2A0411+103              4U0421+34           65.3750   34.7250     3.74                      3U0430+37
                            4U0423-53           65.850    -53.1500    3.30 NGC 1566   3U0400-59   CLUSTER SC0417-55
3 4U0427-07           66.9000   -7.7000     3.46  ABELL  494                                      4U0427-61           66
.5400  -61.5500      2.31  CLUSTER    3U0426-63  SC0430-616  2A0430-614U0429-31           67.3400  -31.0000     3
.82                                                 4U0431-12           67.850    -12.9500    2.54 ABELL 496
                               4U0432+05           68.1000     5.6000    2.76 SEYFERT    3U0440+06       3C120
       4U0443-05           70.8000   -9.5000     1.77                  3U0431-10 SUPERCLUSTER             4U0446+44
  71.530     44.960     4.99                3U 446+44 CLUSTER 3C129         4U0457-35           74.3500  -35.7000
  2.53 KLEMOLA 9                                         4U0504-84           76.2100   -84.3750     2.10
                                4U0504-21           76.2500   -21.3500     3.65 ABELL  514
          4U0506-03           76.6250   -3.4250     1.92                                                        4U0509+01
         77.40        1.950     2.16                                       4U0513-40            78.2600   -40.
150      18.   GLOB CLUS 3U0531-37 NGC 1851   MX0513-40  4U0515+38           78.7600    38.4900     3.19
```

```
                              4U0517+17       79.3900    17.5700    3.10 3C 138
                4U0518-26        79.6400  -26.2000    2.31                                               4U051
3+ 6        79.950      6.5400    2.01 ABELL 539                                    4U0526-72       89.1750
-72.0320    16     2 LMC X-2 3U0521-72                   4U0531+21        82.8770   21.9810    947   CRA
      3U0531+21 TAU X-1                      4U0531-05         82.9600    -5.3000    4.74 ORION       3U0527-05 2A
J532-056               4U0532-66          83.0800   -66.6200    3.92   LMC X-4 3U0532-66                        4
J0538+26            84.55        26.4000    2.36 A0535+26                                     4U0538-64         84.74
10  -64.1400   25    3 LMC X-3 3U0539-64 2A0539-642                   4U0540-69         85.0800  -69.7700    20
 LMC X-1       3U0540-69  2A0540-698               4U0541+60          85.4500    60.8500    2.65
                        4U0543-31          85.9500  -31.6500    3.66                 3U0545-32
    4U0546-88           86.6000   -88.2250    3.55                                                     4U0547+29        8
*.0000    29.0000     4.45                                                           4U0553-48         88.4700   -48.6750
3.00                                                  4U0556-38          89.2500   -38.1000    2.43
                          4U0557+46           89.5600    46.3000    2.86  SEYFERT MCG 8-11-11  MX0600+46 2
4U551+ 4U0559-57          89.9500   -57.1750    3.63                                                4U0608-49
   92.1000   -49.1500    3.08                                                      4U0614+09          93.6270     9.165
0    120   5 STAR     3U0614+09                    4U0614+15           93.7000    15.3000    3.41
                              4U0617+23         54.4200    23.2600    3.44                    3U0620+23 SNR IC443
=3C157      4U0621+11          95.4100    11.7800    2.07                                                 4U0627+6
7        96.8100    67.5700    2.63   SUPERCLUSTER                                    4U0627-38         96.8250  -38
.1000     3.61                                               4U0627-54         96.9400   -54.0250    3.30  CLUST
IR  3U0624-55  SCC627-544 2A0626-544U0628-28          97.2000  -28.4000    4.56  PSR 0628-28
                 4U0629+02          97.5000     2.4000     5.92                                               4U06
34-03           98.7500   -3.3250     4.22                                             4U0638+74         99.6000
 74.2000     2.31 SEYFERT MKN 6       ABELL 558                  4U0655-03          104.0000    -3.1200    2.64
                                    4U0708-16         107.0900   -16.8200    3.06
                      4U0708-49        107.1000   -49.2500     4.07
4U0711-38        107.8250  -38.4000     2.61                                                   4U0718-54        109.5
30  -54.6000     13.44                  3U0705-55 PKS0719-55                4U0722+55         110.0500    55.8800    2.7
'  ABELL 576                                  4U0728-25          112.0750   -25.8250    3.70
                         4U0728-37         112.2500   -37.9000    2.26
    4U0733-18        113.3400  -18.6000    2.17                                                         4U0737-10        1
14.3300    -14.810      3.06                                             4U0738-19         114.7500   -19.9000
 3.84  PKS0745-19                          4U0742-28          115.7300   -28.6600    3.37                     3U0
757-26                              4U0750-49         117.6250   -49.4000     5.38                3U0750-49
             4U0813-38         123.3500   -38.5500    2.80                                                4U0814-56
    123.5500   -56.7500     2.76    A0813-57                                           4U0821-42         125.3950   -42.74
30    7.5   SNR PUP A 3U0821-42   VEL XR-2                   4U0833-45          128.4000   -45.0500    9.1
 3U0833-45 VELA PULSAR                 4U0836-42          129.0500   -42.6150     47     10     TRANSIENT   MX0836-42
               4U0842-47         130.6000  -47.8000     2.95       A0835-48                                         4U0842-
34         130.7400   -34.9200     2.57                                                      4U0844-29          131.2500   -2
3.6750     3.14                                                  4U0854-44          133.5500   -44.5000    3.96   A085
1-45                                    4U0900-40          135.0640   -40.3600     250   10            3U0900-40 VEL
(R-1 HD77581       4U0910-09          135.1900    -9.4000     5.18 ABELL 754 3U0901-09                            4U0
918-66          137.1000   -66.9250     12.0                                                 4U0913-46          138.3000
 -46.1500     3.96                                                          4U0919-54          139.7750   -54.9500    5.44
            3U0918-55                           4U0923-31          140.8350   -31.4850     4.84                   2A0922-317
                        4U0937-12          144.4780   -12.8500     3.3    2A0943-140
 4U0945-30          146.4750   -30.6750     3.39   CLUSTER   3U0946-30  SC0948-327 PKS0947- 4U0955-28          148.
9800   -28.4100     4.83                                                 4U1004+70          151.2000    70.9000     2.
53   M 82         3U0943+71 2A0954+700                4U1015-25          153.7750   -25.4000     3.54     ABELL 955      A
BELL 966                          4U1022-40         155.5100   -40.8500     4.61   PKS 1002-21
    4U1033-26         158.3200   -26.85         1.99 ABELL1060 3U1044-30 2A1033-270                   4U1036-56
159.0400   -56.5500    4.36                 3U1022-55 A1034-56                  4U1041-21          160.4000  -21.8000
  3.28                                                  4U1053-58          163.3200   -58.0800    2.66 N CARINAE
  A1044-59                             4U1057-21           164.2800   -21.8000     2.91   ABELL 1146     2A1058-226
            4U1110-58          157.5500   -58.0000     3.63                                                  4U1118-60
     169.7300   -60.3180    200   11 CENXR3 3U1118-60 STAR KRZEMINSKI        4U1119-77          169.9000   -77.8
JF0     2.41                                                 4U1127-43          170.1500   -43.1750    1.74
                                    4U1130-14          172.6000   -14.6250    2.74   ABELL 1285     PKS1127-14
                4U1136-37          174.2250   -37.3500     2.72       SEYFERT NGC 3783        2A1135-373          4U1137
-65        174.3250   -65.1000     9.59                  3U1134-61                        4U1143+19          175.8750
15.8000       3.01 ABELL1367 3U1144+19 3C264 NGC3862 2A11414U1143+84          176.0100    84.0000     3.44
                                    4U1145-61           176.2800   -61.9450     72     10            3U1145-61 STA
  HD102567           4U1147-12           176.8600   -12.4100     2.42       ABELL 1391       PKS1146-11                  4U
1153-11          178.4000   -11.5500     2.12                                                        4U1153-40          178.475
```

DS030f2

```
                                   DUMP OF TAPE CN111U

  INPUT TAPE  CN111J  ON  FT1
  DATA INPUT      H9 NF=11 SR=11=1=2

          FILE   INPUT     DATA RECORDS     MAX.          READ ERROR SUMMARY                    INPUT RETRIES
                 RECS.        INPUT         SIZE       PERM  ZERO B   SHORT   UNDEF.        #RECS.   TOTAL#
            1      3            3            80          0      1        0       0             0        1
                   1 0       0
  FILE      11   RECORD         1  LENGTH       80BYTES
  (     0)   F0F0F1F0  F0431601F  6E028192  BB431610  8A408F1C  77000547  F0000000  0100001E  8000001E  39000000
  (    40)   79007A01  00F0F0F1   F0F14316  10939BF2  C8984316  11AD15A1  420CC005  47F00000  1E810000  3CB40000
  (    80)   1E5C037A  00F20079   0000F0F0  F1F0F243  1611BB89  E9F13943  1612D7C7  F45F98C0  0547F00C  003CB500
  (   120)   00583400  001CF900   F3016000  7A0000F0  F0F1F0F3  4316120A  25C94ECA  431613F5  63D6D887  000547F0
  (   160)   00005B35  00007934   00001E2C  C16D01E5  007A0000  F0F0F1F0  F4431613  FD6AB7AD  41431615  19A8C21B
  (   200)   A0000547  F0000079   B5000098  5400001E  3E01E742  60007A00  00F0F0F1  F0F54316  151C0697  0AD24316
  (   240)   163844A4  948F0005   47F00000  98350000  B6B40000  1514026 1 02DACC7A 0000F0F0  F1F0F643  161641A0
  (   280)   0843AF43  15175389   9F07A800  0547F000  00B6B500  00D4F400  001E1192  DB035300  790000F0  F0F1F0F7
  (   320)   43161760  3BEAB99E   4316187C  79F527FD  000547F0  0000D4F5  0000F374  00001E29  035403CD  007A0000
  (   360)   F0F0F1F0  F8431618   85D53BEF  7B431619  A213665D  DB000547  F0000CF3  75100111  F400001E  4103CE04
  (   400)   47007A00  00F0F0F1   F0F94316  19A6C5C1  3FD04316  1AC383CB  AE300005  47F00001  11F50001  33740000
  (   440)   1E470448  04C1007A   0000

  FILE      11   RECORD         2  LENGTH       90BYTES
  (     0)   F0F0F1F1  F043161A   CA0AAC82  EA43161B  E3A9A35B  8A000547  F0000130  7500014E  AC00001D  FF04C205
  (    40)   3A007900  00F0F0F1   F1F14316  1BED4F97  C6034316  1D0636A2  0FE10005  47F00001  4EAD0001  6CDE0000
  (    80)   1BFF053B  05B30079   0000

          FILE   INPUT     DATA RECORDS     MAX.          READ ERROR SUMMARY                    INPUT RETRIES
                 RECS.        INPUT         SIZE       PERM  ZERO B   SHORT   UNDEF.        #RECS.   TOTAL#
           11      2            2            450         0      0        0       0             0        0
  ******    EOF ON COMPLETION OF DUMP FOR REQUEST SR=11=1=2X

  EOJ       DUMP STOPPED AFTER FILE    11        # OF PERMANENT READ ERRORS   0

  START TIME 03/10/92  13:29:36       STOP TIME 03/10/92  13:30:55

  $$
```